A CAHNERS PUBLICATION

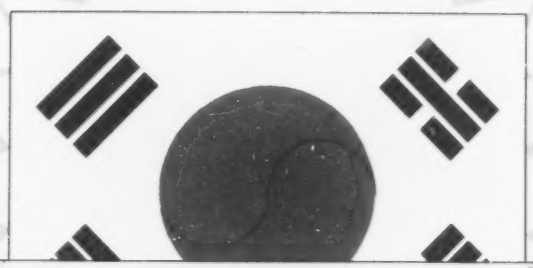
MARCH 1, 1987

- C1850-2
3/3/87

Electronic Business

Japanese computer makers gamble on Unix software

Tax reform's impact on the U.S. electronics industry



21725218 1 006/ 92
APST MGING EDITOR
CRSE ACQUISITIONS
4520 EAST-WEST HWY
BETHESDA MD 20814

HERE COME THE KOREANS

Electronic Business

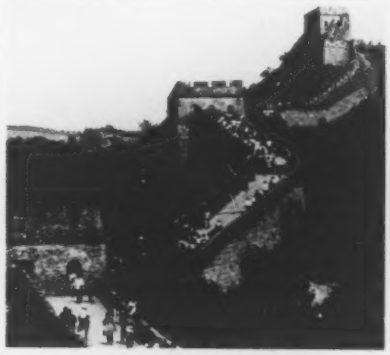
VOL. 13, NO. 5

MARCH 1, 1987

THE BUSINESS MAGAZINE OF ELECTRONICS INDUSTRY

PAGE 24

PAGE 40



PAGE 87

BUSINESS TRENDS

24 Why Japan is using Unix to pry open the U.S. market
From workstations, to chips, to the Sigma project, Japan is betting more and more on Unix software.

30 Taiwanese electronics firms step up U.S. investment
There's no substitute for being there. Taiwanese vendors realize they must have a presence in the U.S.

34 The impact of the trade pact on production gear
U.S. chip equipment manufacturers have plenty of complaints about the U.S.-Japan semi trade pact.

MARKETS

50 Semiconductors: The year of living dangerously
Consolidation, alliances, fickle markets and trade pacts have reshaped the chip business.

58 Comment: The three elements for component success
U.S. component companies need a three-pronged strategy to remain competitive in a global market.

65 Selling VLSI equipment in Japan tests U.S. vendors
U.S. VLSI test equipment makers have been singularly unsuccessful selling in Japan. So why do they persevere?

MANAGEMENT

40 The widening trade gap in Korean electronics
South Korea is running a $7 billion trade surplus with the U.S., some of it in Japanese components.

44 Korea: A land of opportunity, or a profitless battleground?
Two opinions on doing business with the Korean electronics industry.

FINANCE

72 The bottom line on tax reform
Corporate America will pay for tax reform, but careful planning in 1987 can lessen adverse effects.

80 Foreign venture capital comes of age
German, French and Israeli experts offer their views on EEC high-tech venture capital.

PRODUCTIVITY

100 MRP II is alive but will it ever thrive?
DEC, HP and IBM hope so. Their hardware sales stand to climb if MSA and others deliver the software.

AN EDITORIAL INDEX OF ALL COMPANIES DISCUSSED IN THIS ISSUE CAN BE FOUND ON PAGE 110

SPECIAL REPORT

87 The fifth tiger of the Far East
China continues to import electronic equipment from the West. But can it make it in the export market as well?

94 Putting China's high-tech house in order
Zhang Zhi Dong, a Chinese official, talks about what reforms mean on the local level.

96 Comment: China's five-year plan for telecommunications
Development of telecommunications is receiving top priority in China's current five-year plan.

DEPARTMENTS

4 Inside Business

9 Update

17 Business Barometer: U.S. semi market sees hope for this year.

20 Letters

105 Japan Report: Y-E Data expands its peripheral horizon.

106 Calendar

110 Editorial Index

112 Viewpoint: Helping the handicapped help themselves.

Cover illustration/Bill Cooke

ELECTRONIC BUSINESS (ISSN 0163-6197) is published twenty-three times a year by Cahners Publishing, A Division of Reed Publishing USA, 275 Washington Street, Newton, MA 02158. William M. Platt, President; Terrence M. McDermott, Executive Vice President; Jerry D. Neth, Vice President of Publishing Operations; J.J. Walsh, Financial Vice President/Magazine Division; Thomas J. Dellamaria, Vice President Production & Manufacturing; Frank Sibley, Group Vice President. Copyright © 1987 by Reed Publishing USA, a division of Reed Holdings Inc.; Saul Goldweitz, Chairman; Ronald G. Segel, President and Chief Executive Officer; Robert L. Krakoff, Executive Vice President. Advertising and editorial offices: Cahners Building, 275 Washington Street, Newton, MA 02158. Telephone (617) 964-3030. Circulation offices: 270 St. Paul Street, Denver, CO 80206. Telephone (303) 388-4511. Mailing list rentals: (312) 299-9311. Second class postage paid at Denver, CO 80202 and additional mailing offices. Postmaster: Send address changes to ELECTRONIC BUSINESS, 270 St. Paul Street, Denver, CO 80206. ELECTRONIC BUSINESS is circulated to managers of electronics companies. Subscription rates: U.S., Canada and Mexico $50 per year; all other countries $85 per year (including air freight); $170 per year (air mail). Single copy rates: U.S. $6.00; Canada and Mexico $8.00; Foreign $10.00. Cahners Publishing Company • A Division of Reed Publishing USA • Specialized Business Magazines for Building & Construction • Electronics & Computers • Foodservice • Manufacturing • Book Publishing & Libraries • Medical/Health Care

VBPA ABP

U.S. semiconductor market sees hope for this year

Niche companies are star performers. New microprocessors and tight inventories may win in 1987

It was nice that 1986 ended with a bang for the U.S. semiconductor market. The Semiconductor Industry Association's (SIA) book-to-bill ratio, the market's most watched (although sometimes misinterpreted) indicator, had slowly inched its way up toward unity in the first part of the quarter and then shot up to 1.08 in December, amid an encouraging environment of growing orders and shipments. SIA's statistics show that the quarter's revenue, up 17% for all semis (18% for integrated circuits) over a year ago, managed to push 1986's growth over 5%. Market research firm Integrated Circuit Engineering Corp., which claims to have correctly forecast a year ago the performance of the U.S. market for 1986, does not expect any better news for 1987 because it predicts that the production of electronic systems in the United States, the markets that use semiconductors, will grow only by 3%, about the same as last year.

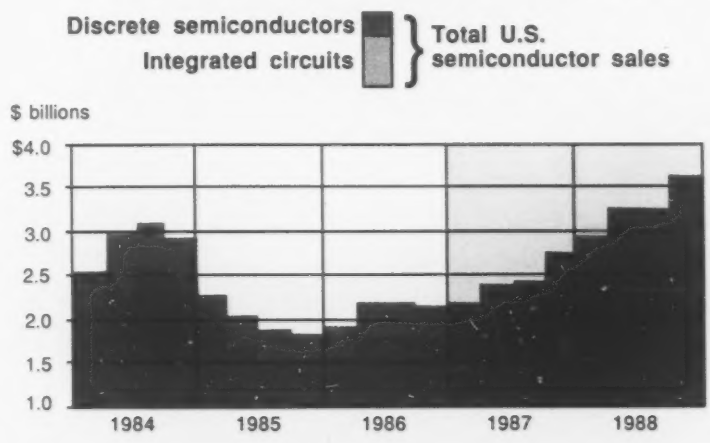
The SIA's figures report on the market, however, not on those which supplied the chips and partook of the gain. But it is likely that local chip makers this year may recover some share of their turf.

The picture has been much better for chip makers that concentrate on market niches. Silicon Systems Inc., a chip maker 30 times smaller than Intel, which concentrates on ICs for the booming Winchester disk market, increased sales by 54%. Integrated Device Technology, a complementary metal-oxide semiconductor (CMOS) random-access memory (RAM) specialist that is 20 time smaller than Intel, increased its fourth quarter sales by 30%, about the rate that Intel used to grow when it was the size of IDT. And VLSI Technology, one of the pioneers of application specific ICs (ASICs) and computer-aided engineering (CAE) software, one-tenth the size of Intel, grew by 42% with respect to 1985.

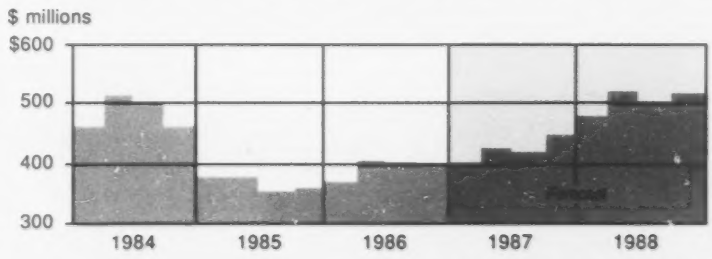
Hopes for the larger chip makers could be dimmed if the current spurt is due to customers rebuilding inventories rather than increasing real demand. But customers are managing inventories better today than at any time in the past. Jerry R. Junkins, president and chief executive of Texas Instruments Inc., whose sales of ICs are almost double Intel's, makes a convincing argument for lean inventories. At a presentation last quarter before the New York Society of Securities Analysts, Junkins said that a TI survey revealed that U.S. electronic equipment manufacturers had "lowered their desired inventory-to-sales ratios [since 1982] from 11 to six weeks," almost one-half. TI has developed ship-to-stock and just-in-time programs with "55 leading electronic equipment companies" up from only seven in 1984. This reduction in the inventory required to maintain production is tantamount to a gap of five weeks in orders. Although there may be still more economies left to implement in semiconductor inventories, it is very likely that, in 1987, equipment manufacturers' purchases of semiconductors may grow at the same rate as their production of equipment.

ALBERTO SOCOLOVSKY

U.S. semiconductor sales



U.S. distributors' shipments of semiconductors



Historical data: Semiconductor Industry Association
Forecast: Cahners Economics

Steady growth expected

The United States Index of Industrial Production, a coincident indicator of the U.S. economy, showed a mild decline in the second quarter, followed by a slight recovery in the third quarter. For 1986, production is expected to be up a scant 0.9% from the previous year. This year, steady improvements are forecast throughout the year pushing production up 3.9%.

The Cahners Early Warning Indicator (CEWI) is a weighted average of housing starts, the Dow Jones Industrial Stock Index and the money supply (M2) — deflated by the Consumer Price Index. It forecasts probable business cycles about 12 months in advance. The black curve is a plot of the 12-month rate of change Index of Industrial Production. That is, its change over a 12-month period can be determined by comparison with the line at 100. For example, the 103.9 level forecasts using the CEWI for the end of this year indicates that the average for all of 1987 should be 3.9% above 1986.

Readers can obtain a brochure explaining the CEWI method from Cheryl Patstone, economist, Cahners Economics Department, 3021 Tisch Way, Suite 100, San Jose, Calif. 95128.

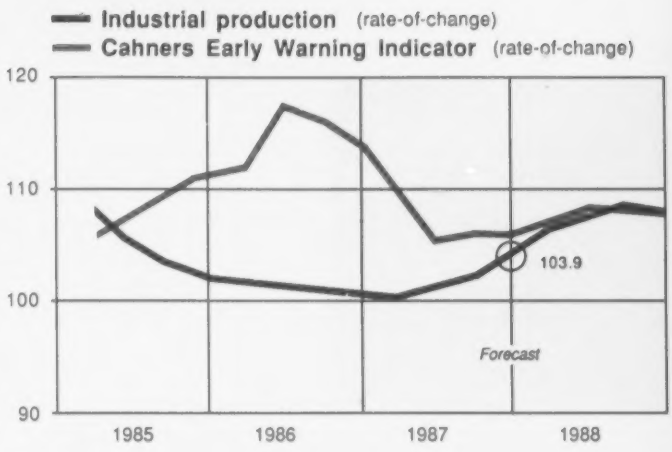
Defense and space equipment

Growth in the defense industries continues to be restrained by the cutbacks in government funding that were made in fiscal years 1986 and 1987. Those back-to-back budget cuts of 4.2% and 2.5% (after adjustment for inflation) forced the Pentagon to stretch out many procurement programs and caused growth in equipment production to slow from nearly 10% (on a year-to-year basis) in late 1985 to just 5% by mid-1986. The growth rate stabilized at 4% to 5% in the third quarter and is expected to remain near that level into early 1987. But President Reagan's recent request for a modest 3% real increase in the fiscal year 1988 defense budget suggests that market growth will dip lower in the late 1980s. Production, which grew 1.5% between last year's second and third quarters, should post an overall increase of 5.5% for 1986.

Aircraft and parts

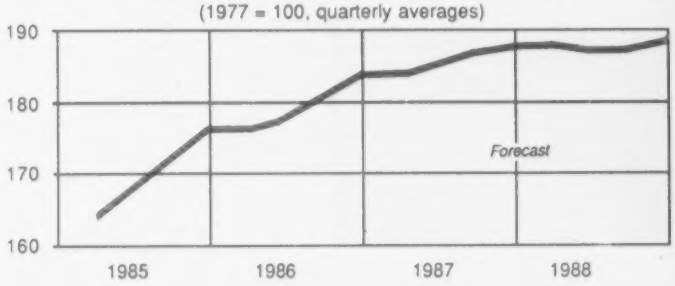
Total production of commercial and military aircraft increased 2.5% in last year's third quarter (outpacing a year ago by an 11% margin). A tapering off in defense procurement is expected to pull the growth rate below 2% in the fourth quarter, but manufacturers will still see a real gain of 12.3% for 1986 as a whole, the industry's best performance in seven years. A recent upsurge in demand for commercial equipment will give manufacturers a near-term boost, softening the negative effects of a leveling off in the larger defense sector. Production should increase 5.5% in real terms in 1987.

Economic indicators



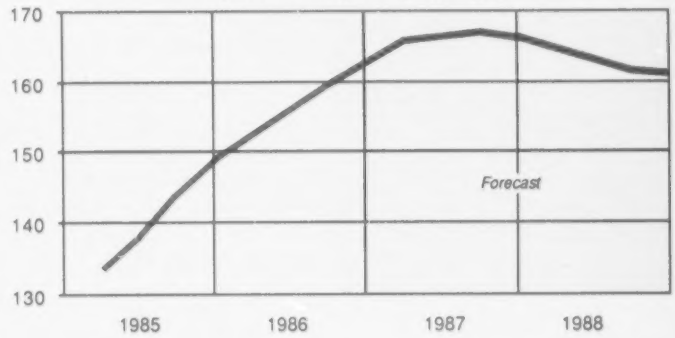
Industrial production: Defense and space equipment

(1977 = 100, quarterly averages)



Industrial production: Aircraft and parts

(1977 = 100, quarterly averages)



Historical data: Federal Reserve Board
Forecast: Cahners Economics

Unix: Japan jumps into the U.S. computer marketplace

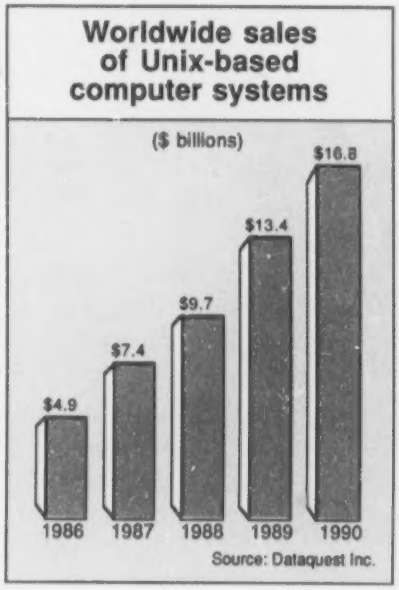
From workstations, to chips, to the Sigma project, it looks like Japan is betting more and more on Unix

As director of international marketing for the Computer Systems Division of Gould Inc., Luis Zuniga has been trying to increase Gould's presence in Japan. In searching for a Japanese business partner to help smooth the way, Zuniga has made an interesting discovery. Japanese companies are most anxious to avail themselves of Gould's Unix expertise. "Unix gives them an excellent avenue to catch up," explains Zuniga. "They have an extremely high interest in Unix."

Evidence of that interest is beginning to surface everywhere. Licensing of the Unix source code in Japan has been growing at an annual rate approaching 60%. Japanese firms have been locking up such Unix powerhouses as AT&T, Motorola Inc. and Sun Microsystems Inc. in partnerships that give them access to Unix technology and product. NEC Corp., Hitachi Ltd., Mitsubishi Corp. and Sony Corp. are already marketing Unix-based workstations in Japan. And NEC has now begun selling its own EWS-E engineering workstation, along with a line of 32-bit Unix-based minicomputers, in the United States as well. Fujitsu Ltd. and Hitachi, meanwhile, are collaborating on development of a 32-bit microprocessor that will support Unix (along with the nascent real-time operating system, TRON). And most important of all, the strategic and secretive Sigma project — backed by Japan's powerful Ministry of International Trade and Industry (MITI) and intended to give Japan Unix software leadership — is making quiet progress.

For NEC, Unix is a "primary strategic action item," according to Frank Girard, vice president of systems marketing for NEC Information Systems in Boxborough, Mass. "The momentum of Unix in the U.S. marketplace is pretty clear," observes John Reimer, manager of advanced products for Fujitsu Microelectronics in Santa Clara, Calif. "To not address that momentum, I think, would be asking for trouble."

Actually, there's more than market momentum attracting the Japanese to Unix. Lacking a substantial installed base tied to their own proprietary operating systems and historically unproductive in developing applications for other systems environments, software standardization has long been Japan's chief hope for penetrating world computer markets. Operating systems that have already emerged as standards are supported by well-stocked applications libraries and offer large potential hardware markets. Such are ideal conditions in which the Japanese can best exploit their vertical integration and manufacturing capabilities to concentrate on the production of low-cost hardware.



This, to date, has been their strategy in mainframes (with the exception of NEC) and personal computers (PCs). In each case, Japanese firms have sought to piggyback IBM software standards. But those strategies may no longer be viable. In mainframes, the 1982 FBI sting operation that allegedly caught Japanese executives offering to illegally obtain IBM's proprietary MVS/XA software code led to U.S. court-approved settlements and notoriety that cost Hitachi and Mitsubishi Corp. dearly. IBM has more recently turned the heat up on Fujitsu as it more aggressively protects its strategic systems software. As a result, many in Japan now feel the IBM-compatible strategy is doomed. Meanwhile, in personal computers, the Japanese find themselves squeezed between innovative American and lower cost Asian compatible makers and have managed only minimal U.S. market penetration.

Market momentum

Enter Unix, an emerging nonproprietary standard whose licensing has been encouraged by its developer (AT&T). Unix, additionally, seems tailor-made for the Japanese. As perhaps the most "portable" of all operating systems, Unix can be run on an unusually broad range of processors. Unix code is currently executed on microcomputers, Cray Research Inc. supercomputers and just about everything in between. With the worldwide market for Unix-based computer systems expected to reach $16.8 billion by 1990 (according to Dataquest Inc.), it is impossible to imagine a more ideal opportunity for Japan's nonpareil high-volume hardware manufacturers.

"Unix represents an opportunity to have portability between a complete family of products, ranging from personal computers, desktop workstations and advanced workstations up to multiuser departmental and applications processors and going all the way up to mainframes," explains NEC's Girard. Asked if such PC to mainframe Unix capability was in NEC's future, Girard responded: "Yes."

NEC and other Japanese firms are

Jean-Francois Allaux

focusing first on the engineering workstation market where Unix has proved especially strong. Strong enough, for example, to propel Sun Microsystems, a 1982 start-up, to sales of roughly $200 million in just the last two quarters (July-December, 1986). Sun has excelled in building hardware platforms and communications optimized for the Berkeley 4.2 version of Unix. Now Sun executives recognize that they are a primary target to strategists in Tokyo.

"The Japanese are definitely going to be a factor in the workstation market in Japan and here," says Joseph Roebuck, Sun's vice president of sales. "Workstations are a top priority for the Japanese as a country, as a government. All the leading computer companies in Japan are working with MITI to address the market." Roebuck concludes: "We've got to be prepared to compete with them both in Japan and in the U.S." Charlie Perrell, director of intercontinental sales and support for Sun, also expects a flurry of activity from the Japanese centered on Unix systems. "We believe that will be the operating system they concentrate on. There is no other choice. It is here. It is today."

But the Japanese, who have a knack for such things, are preparing for tomorrow too. And that's why they're investing an estimated $120 million in the Sigma project. "Sigma, as far as I am concerned, is the most significant thing going on in the world, as far as Unix," contends Larry Crume, president of AT&T's Tokyo-based Unix Pacific subsidiary. Crume should know. He led the AT&T team that developed Unix System V. Now he heads up AT&T's Unix development and licensing activities in the Far East and is one of the few Americans involved in the Sigma effort. Indeed, it is AT&T's cooperation with the Japanese on the Sigma Project [ELECTRONIC BUSINESS, Feb. 1, 1986 p62] that lends so much promise to their thrust in Unix.

The ostensible goal of Sigma is the

improvement of software development productivity through the creation of a standard Unix software development engine that would eventually network all of Japan's software engineers. But Crume believes that the creation of a software development workstation may eventually prove to be one of the lesser accomplishments of the project.

Crume is convinced that Sigma is going to give the Japanese a leg up in Unix markets. "I think they'll lead the world in Unix applications software. What they're going to build is solution systems. They're going to build solution systems for consumers," says Crume. He cites banking and point-of-sale systems as two areas where Sigma software solutions could emerge.

What has impressed Crume most is the way Sigma's 40 Japanese software engineers (contributed by their employers to the project) are able to draw on the technical expertise of the entire Japanese nation. Each operating group in the project interacts with a committee that includes technical experts from both industry and academia. As a result of such broad input, the project draws on the resources of all Japan and addresses issues that might otherwise be overlooked.

At one recent committee meeting, for example, the issue of common logical forms for floppy disks used by Unix workstations from different vendors was unexpectedly raised. Common logical forms would allow disks to be freely interchanged between different hardware systems. "While that's not necessarily a part of the Sigma software productivity project, it's the kind of thing that starts to get into the project as they get everything aligned," reports Crume. "The point is that sort of thing comes in even though it's not the major thing."

Because Sigma is structured to absorb contributions from Japan's broader technical community, Crume believes its accomplishments will transcend its stated goals. The software development engine itself has been specified and its capabilities (which include a 32-bit processor, a cathode ray tube with at least 1,000 by 1,000 pixel resolution, at least four megabytes of main memory and the ability to execute one million or more instructions per second) are certainly not exceptional. But that standardized engine is just the start, according to Crume. It will be the template for other workstations designed for a variety of applications. "That Sigma workstation will be moved by peripherals and software" into other vertical applications, Crume predicts. Once the Japanese have standardized the base hardware, they can develop the software and specialized peripherals, such as keyboards, displays, mass storage and others, tailored to specific vertical markets.

The Japanese are likely to benefit from the synergy that develops between their Unix hardware and software. "The most successful software is that software developed using the system it's going to run on," explains Crume. Hence, the software development engine, modified for specialized

applications, becomes the platform of choice for the applications software it was used to develop. Sigma, therefore, becomes the cornerstone of Japan's software and hardware ambitions in Unix.

Just as the Sigma project draws on the entire technical expertise of the nation, it educates the nation in the systems and standards it produces. "I think that the Japanese are pretty shrewd business people in the sense that they build the infrastructure in their own companies in using things. Then they build the infrastructure in their own country by making the product attractive in their own country. Then, it's an easier move outside to other countries," says Crume. By concentrating first on solving an internal problem — inferior software development capabilities — and by involving the entire country in the effort and in the solution, the Japanese develop a capability that eventually can be exported.

Larry Michels, president of the Santa Cruz Operation, a company that sells Xenix systems software (a derivative of Unix), along with Unix applications packages, describes the Sigma Project as "scary." "When the Japanese band together, I just sort of look at it and shudder." The cooperation of Japanese industry leaders, along with the allocation of so much capital to what is essentially a long-term project, give the Japanese powerful advantages over U.S. firms with myopic earning horizons.

Michels sees the Sigma project as a concerted effort by the Japanese to play catch-up in the computer industry. "The fact is the Japanese have not succeeded in any real measure in computers in this country . . . I see the Sigma project as a step of banding Japanese industry together for a longer term solution to try and be more effective in competing in the U.S. market."

Some Sigma doubts

Although there appears to be consensus strategy behind Sigma in Japan, it is worth noting that the project has harbored internal debate, has left some difficult questions unresolved and is in some ways controversial.

Unix, to begin with, is more like two standards than one standard. Scientific and technical users generally demand the higher performance Berkeley version, while System V is more often the choice in commercial environments. The Japanese spent a lot of time trying to establish exactly which version they would specify for the Sigma workstation. Although Sigma did finally settle on System V, the long delay apparently did not please some of Japan's Unix hopefuls. Toshiba Corp. entered into partnership to resell the hardware of Berkeley apostle Sun. And Sony Corp. developed its own low-end engineering workstation around Berkeley 4.2. Crume says that Sigma will add some commands from the more speedy 4.2 in moving toward a harmonized Unix that should parallel the Berkeley-System V convergence being engineered by AT&T and Sun.

As yet unresolved is the question of whether the Japanese will push Unix in their business systems. The question is a tough one. On the one hand, Unix has never had the commercial penetration that it achieved in the engineering and scientific markets. This would seem to argue against a commitment to commercial Unix. On the other hand, it is in part the dearth of applications software that has held back commercial Unix. As such, the major opportunity for Sigma may ac-

tually lie in churning out commercial Unix applications. Crume suggests the Japanese will go this way; producing total software solution systems for retail, banking and other industries. But Michels of Santa Cruz Operation believes that the Japanese see Unix as a development environment and as a standard for technical users but do not really see Unix as a business software environment. Sigma, he argues, could divert some of its programmers into applications development for PC-DOS and other established commercial operating systems.

In spite of all its potential, the thrust toward Unix is not viewed with universal equanimity within Japan. It is now accepted that the strategy of piggybacking IBM's software standards, though moderately successful in mainframes, has become increasingly risky as IBM more aggressively protects its systems software. Why then, should Japan tie its fortunes to yet another U.S. giant? In committing to Unix, the argument goes, Japan is putting itself at the mercy of AT&T, which is still the most powerful force in Unix development and to whom the Japanese must pay licensing and royalty fees. True, AT&T, which is an investor and participant in Sigma, has been cooperative in ways IBM has never been. But, the Unix skeptics say, Unix still leaves Japanese industry dependent on a foreign firm.

For this reason, the Japanese have made some steps toward developing their own proprietary systems software: TRON. There is no question that the Japanese would like to see this new operating system, already being touted as the technology for the 1990s by its developer, Tokyo University professor Ken Sakamura [ELECTRONIC BUSINESS, Nov. 15, 1986 p82], take root. TRON, which is designed to better harness the speed of 32-bit and the next generation 64-bit microprocessors, is an ambitious undertaking.

But successful new software environments are few, far between and awfully slow to develop. At best, if it is a spectacular success, TRON will become an alternative software environment of some consequence in the next decade. After all, it has taken Unix, for all its unique advantages, more than 15 years to approach the status of standard.

A familiar drama

Meanwhile, a disturbingly familiar drama is being enacted. "Strategic alliances" are now being touted as the new master keys to Japan's Magic Kingdom. With the Japanese dangling the ever-tantalizing, mirage-like promise of sales in Japan as incentive, American firms are unburdening themselves of their own Unix secrets. Gould's Zunga, along with other American executives, accepts that his company must share technology to win access to Japanese markets. It may well be that the cooperation of AT&T with Sigma, as well as the technology exchanges between Motorola Inc. and Toshiba, and the remarketing arrangements between Sun and Toshiba will benefit all parties. It is already clear that these arrangements serve the long-term strategic interests of the Japanese and, at a minimum, the shorter term interests of their American partners. History, however, suggests that Unix technology will be transferred far more swiftly and surely than the Japanese market is unlocked.

NORM ALSTER

Guide to Instrumentation. Free.
PRODUCT GUIDE
US
1987/88 Product Guide. It describes and compares design and test equipment.
Rent, Lease, Purchase.
Thousands of products from more than 120 manufacturers. The U.S. Instrument Rentals 1987/88 Product Guide has it all. Detailed product descriptions. Useful specification tables. Configuration guides. Manufacturer comparison charts. And more. A comprehensive hardbound reference tool. Yours free when you call.
800-824-2873
United States Instrument Rentals, Inc.
A U.S Leasing Company
US

The widening trade gap in Korean electronics

South Korea is currently running a $7 billion trade surplus with the U.S., some of it in Japanese components

By Andrew Tank

South Korea's booming electronics industry is worrying U.S. trade officials.

"It's a huge gaping back door," says one senior U.S. diplomat in Seoul, referring to the high proportion of Japanese-made parts in Korean exports to the United States. This counteracts the impact of devaluing the U.S. dollar against the yen since the Korean currency has been devalued almost as much. The result is that U.S. economists predict Korea will earn a $7 billion trade surplus with the United States this year, but incur a $6 billion deficit with Japan — with many of the U.S. dollars indirectly being recycled to Japan.

Korean goverment officials exhort companies to do something about this — buy more from America, sell more to Europe, develop indigenous technology — but meanwhile the fortuitous turn of events is consolidating South Korea as an even stronger electronics producer.

When all the figures are in, it is expected that Korea's electronics production will have topped $10 billion last year, compared with $7.2 billion in 1985, according to the Electronics Industries Association of Korea (EIAK). Exports in 1986 were expected to have been up at least 50% to $6.5 billion, with about two-thirds of them destined for North America.

The detailed trade statistics for the first nine months of 1986 show that substantial gains have been made across the board compared with the same period last year: video tape recorders up 189% to $361 million, personal computers up 88% to $477 million, semiconductors up 39% to $1,015 million. Overall, exports of consumer products and components each accounted for around 42% of the total, while industrial electronics represented just 16%.

The snag is that all this trade is very lopsided. Japan accounts for about 50% of imports but buys just 10% of exports. The U.S. buys over 60% of exports but sells just 35% of imports.

A protected market

Says the executive vice president of the American Chamber of Commerce in Korea, General Frederick C. Krause: "The fundamental problem is that this market is only very selectively open to the inflow of U.S. goods and services. It's a very protected market."

In the 1960s, the Japanese took the leading position as supplier of technology and parts from the United States. This was due to geographical proximity, a shared language with many elder business executives and through offering more competitive deals.

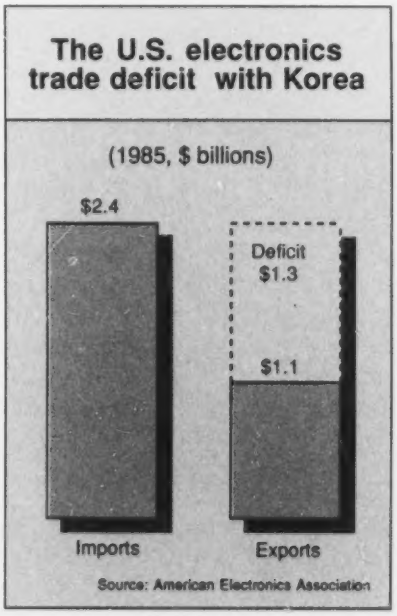
However, the Koreans are not entirely happy with the way this has turned out. Says the manager of the international department at the EIAK, Yorm Kim: "Our industry is not satisfied with the technology that Japanese companies have transferred. The core technology was not given to us. Especially in the high technology we don't believe they will transfer enough technology."

Adds Marvin J. Winship, director of the International Executive Service Corps in Korea and a long-time resident: "Their relationship with Japan is a love-hate relationship. Other things being equal they would generally prefer an American joint venture to a Japanese one."

The difference between the American and Japanese approach is summed up by K. Mook Choi, general manager at Goldstar Semiconductor: "U.S. companies are likely to analyze the good effects and if they see profits they will transfer the technology. The Japanese are worried about the so-called boomerang effect [Korean exports competing with Japanese ones] so even if they see a profit they will be more reluctant to transfer technology."

There have been recent reports that Japanese firms have been reluctant to supply sufficient quantities of key components — such as head drums for video cassette recorders, thermal printer heads for facsimile machines, microwave oven doors and integrated circuits — to maintain greatly increased flows of Korean exports to the United States. This may be due to mundane supply problems rather than perfidious scheming, but it is clear that at present the whole Korean success story is dangerously dependent on Japan.

This dependency is highlighted by a recent survey done by Samsung Electronics on the proportion of imported parts as a percentage of the total value of the product: printers, 65%; personal computers, 60%; cathode ray tube ter-



The leading South Korean electronics firms in the first half of 1986

Corporation	Sales[1] ($ millions)	% change[2]	Profit[3] ($ millions)	% change[2]	Debt to equity ratio	Assets[4] ($ millions)
Samsung Electronics	$1,256	+23.1%	$23.7	+26.2%	6.60	$2,346
Goldstar Co.	890	+7.1%	9.3	+104%	4.97	1,137
Daewoo Electronics	285	+49.9%	3.8	+194.6%	9.70	750
Goldstar Cable	215	+26.0%	4.1	N/A	4.38	344
Samsung Semiconductor	173	+30.6%	6.6	+22.3%	7.37	853
Taihan Electric Wire	142	+27.3%	3.4	+26.2%	2.44	298
Samsung Electronic Devices	124	+17.6%	3.2	-23.0%	2.71	203
Hyundai Electronics*	110	+120.0%	N/A	N/A	N/A	N/A
Goldstar Semiconductor*	100	+25.0%	N/A	N/A	N/A	N/A
Samsung Electronic Parts	89	+61.3%	3.5	+30.0%	2.43	152
Anam Industrial	83	+47.6%	0.7	N/A	3.33	178
Goldstar Telecom	73	+20.7%	2.0	+163.6%	1.21	125
Oriental Precision	49	+65.6%	C.4	+183.3%	3.37	118
Goldstar Electric	47	+27.6%	-7.4	N/A	10.74	143
Goldstar Instrument and Electric	46	+14.3%	1.3	+33.3%	4.76	106
Dongwon Electronics	32	+20.7%	0.4	-53.0%	3.06	42
Shinyeong Electric	30	+13.6%	-3.4	N/A	4.45	88
Maxon Electronics	28	+61.0%	0.8	+100%	1.70	35

[1] Sales for the first half of 1986
[2] Percentage change compared with the first half of 1985
[3] Net income after tax for the first half of 1986
[4] Assets at the end of first half of 1986

All conversions at $1 = 870 won
*Table shows all of the major electronics firms listed on the Korean stock exchange. Major unlisted companies have also been included, but the first half figures have been estimated from reliable industry sources. These are indicated with an * after the name of the company.

Source: *Business Korea*, ELECTRONIC BUSINESS

minals, 50%; export model cassette recorders, 50%; facsimiles 40%, VCRs, 35%; microwave ovens, 25%; and color televisions, 10%.

For all these items, crucial to the export success of Korea, Japan is the source of supply for almost every imported part.

The EIAK's Kim accepts that the introduction of Japanese technology is crucial to Korea. "The joint ventures with foreign companies were the basic foundation for the growth of the Korean electronics industry," he says. "Initially most came from the U.S.A., but then Japan became a more convenient place to get technology because of geographical closeness and language." But today Kim describes the surplus with the United States and the deficit with Japan as "our major concern in industry and in government. We will try our best efforts to close that gap."

Closing the gap

One company which is already doing that is Goldstar Semiconductor which is a joint venture between AT&T of the United States and the Goldstar Group. The venture makes telecommunications switches, micro- and mini- business computers and a range of semiconductors — including complementary metal-oxide semiconductor (CMOS) gate arrays of up to 10,000 gates, 1 megabit read-only memories (ROMs), 64K static random-access memories (SRAMs) and 64K dynamic random-access memories (DRAMs). General manager Choi expects sales to increase from $160 million last year to around $200 million this year. He also expects Korean semiconductor makers will benefit from the recent price fixing deal between Japan and America. "We have not, up to now, been in a profitable position," he says. "We now hope within a year to be profitable."

> In a bid to keep up, Korea's leading firms are devoting more resources to R&D

Certainly Korea's electronics majors have decided to invest heavily in semiconductor production capacity and are devoting a growing share of revenue to research and development (R&D). EIAK figures show that during 1985 and 1986, Samsung Semiconductor and Telecommunications will invest $450 million and spend $90 million on R&D for semiconductors. The equivalent figures for Goldstar Semiconductor are $215 million, with $42 million for R&D; and for Hyundai Electronics, $190 million, with $32 million on R&D. Optimistic forecasts suggest Korean firms could boost their share of the world semiconductor memory chip market to almost 10%, from 5% to 6% today.

Samsung is now making about 3 million 64K DRAMs and 3 million 256K DRAMs a month, as well as a small number of electrically programmable read-only memories (EPROMS). It recently announced the development of a 256K SRAM. Hyundai Electronics — which has only entered the field in 1983 — hopes to be offering a complete range of memory products by year's end. Its plant can make 650,00 five- and six-inch wafers a year.

In a bid to keep up, Korea's leading firms are devoting more resources to R&D. Goldstar now devotes 7% of sales revenue to R&D and Daewoo and Samsung spend around 4%. The industry average of 3.5% is high in relation to the rest of Korean industry but is still low by world standards for the electronics industry.

Korean firms are keen to develop indigenous technology in the consumer electronics area, too. The three major makers of video tape recorders — Daewoo, Goldstar and Samsung — have set up task forces to increase the locally made proportion from the current 65% to 75% within a year.

However, there are limits to the extent to which Korean firms have the resources to develop all the technology they need, and they are keen to

develop links with new sources of technology. For this reason Seoul is being inudated with American and European executives. Many stay, ironically enough, in luxury hotels built with Japanese capital.

Last fall, for example, a delegation of 41 West German firms participated in a technology transfer symposium, attended by over 2,500 engineers and executives from Korean firms. The mission concentrated on the production automation, computer-aided design and manufacturing (CAD/CAM), and other factory equipment. Says the project manager in charge, Bernd Reichhardt: "The appreciation of the yen means that, at this time, the gap between German and Japanese prices has fallen. While a year ago they were typically 30% more expensive, now they are less than 10%. Many Koreans say they would prefer German machinery even if it is 10% more expensive because there is more technology transfer than with the Japanese."

In another event at about the same time, 14 French companies organized a teleconferencing event sponsored by the French Direction Generale des Telecommunications in cooperation with the Korea Telecommunications Authority and other organizations. The French firms — including Alcatel, Bull and Crouzet — discussed the latest French switching and transmission equipment and possible joint ventures.

Keen to diversify

The Korean electronics industry is keen to diversify its export markets as well as its sources of supply. Last year just 4% of Korean electronics exports went to West Germany, 3% to Britain, and 2% to France. The market planning manager at Hyundai Electronics, Soon-chun Shin, says that his company is aiming over the next few years to double the proportion of sales in Europe, from 15% to 30% of total sales and in Asia from 5% to 10%. The share of North America would fall from over 55% now to less than 45%, with a slight fall in proportion sold locally.

To underline this trend, Samsung Electronics has just announced it will invest $25 million to build a consumer electronics plant in the depressed northeast of England. By 1990, the plant will be making 250,000 VCRs, 300,000 microwave ovens and 300,000 color televisions a year for export to the European Economic Community. Samsung also has a plant in Portugal making 200,000 color TVs a year and a plant in New Jersey, making around 100,000 color TVs.

Goldstar's factory in Alabama is reported to be one of the company's most successful foreign plants — with product rejection rates among the lowest in the group and staff absenteeism at just 1%, compared with a U.S. average of 5%. It makes 500,000 microwave ovens and over 1 million color TVs a year for sale in North America and Mexico.

Goldstar has also just started construction of a factory in Worms, West Germany. It is investing $2.6 million and an additional $28 million has been raised locally. The plant is scheduled to start production next September and will have a capacity of 400,000 VCRs and 300,000 color TV sets a year.

The approach is described by Andrew G. Grose, executive director of the Commission on Economic Development for the State of Nevada, who has just organized a mission to Korea to attract inward investment: "Korea is already talking about investing where its markets are. They don't want to get in the same bind the Japanese are in. They've learned from them."

Maybe. But U.S. trade officials are not convinced. U.S. diplomats say privately that it might be necessary to file some more Section 301 unfair trading cases against Korea to make its government realize that the United States means business.

"They continually structure their trade pattern after Japan's," adds Winship of the International Executive Service Corps. "They say: Japan was successful; so they think they can be successful ad infinitum." He argues that Americans just have to keep on battering the Koreans to open their market to imported products.

And American Chamber of Commerce head Krause reckons: "The way out is not protectionism. But there has to be legislation to promote reciprocity," he says. Krause expects the new Congress will enact trade laws to balance the books against those countries with persistent current account surpluses with the U.S. — notably Japan, South Korea, Taiwan and West Germany.

Meanwhile South Korea's electronics industry grows like Topsy.

The Ministry of Trade and Industry forecasts that electronics production and exports will keep on rising at around 19% a year over the next five years. That would mean output of $21.9 billion and exports of $13.1 billion by 1991. Those forecasts may already be outdated: the target for 1987 will be met in 1986!

The official line is described by Park Young Tahk, deputy director at the MTI: "We are not a second Japan. We are interested in long mutual benefit, not just short term profits."

But one exasperated U.S. executive sums up a mood which could limit some of Korea's fast growing export hopes: "It's nauseating to hear them complaining of protectionism in the U.S. when they do it with [such] great fervor."

Tank, a New Delhi-based business writer, recently spent three weeks in South Korea preparing this report.

Announced R&D activities in semiconductors

Company	Products	R&D spending ($ millions)	Change ($ millions)
Samsung	1Mb DRAM; 64K SRAM; 8-, 16-bit μC; high-performance CMOS TTL; 10K gate array	$28	No change
Goldstar	1Mb DRAM, 64K EPROM, high-performance CMOS TTL, bipolar IC, consumer IC	$23	+$19
Hyundai	1Mb CMOS DRAM, 64K EEPROM, 264K video DRAM, programmable electrically-erasable logic	$13	+$11
Daewoo	Gate array, consumer IC, power IC	$5	N/A
KEC	Consumer IC, power tranceiver, UHF tranceiver	$3.5	No change

N/A = Not available

Source: Dataquest Inc.

Korea: A land of opportunity, or a profitless battleground?

Vibrancy of the electronics industry means business for U.S. suppliers

By Wan Hee Kim

Korea's prosperous economic outlook and its concerns about becoming overly dependent on Japanese imports present U.S. electronics companies with an excellent opportunity to do business with Korea.

U.S. companies and government officials already have been applying great political pressure on Korea to open up its domestic markets to many industrial and agricultural products made in America. Their motive is to make money from Korea's strong, expanding economy. The country's economic growth is expected to average 7.2% annually for the next five years, with its gross national product reaching $166 billion in 1991.

WAN HEE KIM

Korean manufacturers and the Korean government, meanwhile, are doing their best to reduce the country's trade deficit with Japan. It totaled a $5.8 billion in 1986 alone. They are eagerly searching for new sources of supply for technology, equipment and parts, in addition to boosting their own exports to Japan.

There is evidence of progress on at least one front. Negotiations between the U.S. and Korean governments have resulted in Korea's agreeing to revise its own patent and other laws relevant to the recognition of foreign intellectual property rights. The revised laws, which govern areas such as technology trademarks, will become effective in September of this year.

Korea also has agreed to admit American-made personal computers by July 1987 and computer peripherals by July 1988.

At the same time, the U.S. government has asked for the drastic reduction of tariffs Korea has posed on 27 items, including frozen vegetables, soft drinks, cosmetics, films and other products from the United States. Consequently, Korea has just announced its decision on the reduction of tariffs on American-produced speakers, chocolates, tennis rackets and other U.S. products, starting in 1988.

Production of small computers and related products already is booming in Korea. Manufacturers in Korea, this year, already have export orders totaling more than 1.5 million personal computers — mostly from U.S. compa-

The Japanese foothold is too strong for U.S. companies

By Young C. Kim

The electronics capital equipment market in Korea was dominated by U.S. manufacturers up until a few years ago. But an aggressive market-share approach by Japanese manufacturers, characterized by low pricing and supported by excellent service, toppled the U.S. lead. And it is highly unlikely that U.S. manufacturers can regain the ground lost to the Japanese in Korea.

The worldwide slump in semiconductor sales has only made matters worse in Korea from a U.S. manufacturer's perspective. While sluggish chip sales have produced a flurry of moves by practically all equipment makers to protect their market shares in every major region, including Korea, none has moved as aggressively as Japanese equipment suppliers. They are more protective of their market share than their U.S. counterparts. And they will do anything to keep their U.S. competitors from chipping away their market share.

YOUNG C. KIM

The chief protective measure employed by the Japanese is aggressive pricing. Their strategy is to get market share first, usually through low prices, and profits later. U.S. manufacturers, on the contrary, are more interested in making money today — profit performance is more important than market share.

The way the Japanese companies are expanding their foothold in Korea may not necessarily be profitable for now. But they certainly aim to earn money on future business. They come in cheap on current bids with the intention of making up for any losses on subsequent sales.

Pricing is not the only measure used by the Japanese. They also do an excellent job for their customers. Korean engineers claim their Japanese equipment suppliers fulfill their obligations as promised. The engineers also praise the Japanese for how quickly they react to equipment problems, saying their response time is incomparably faster than that of their U.S. counterparts. "American companies are no longer competitive whether it is price, performance or support," says one Korean engineer.

Korean electronics companies want to buy American equipment — in part to balance trade with the United

John Kirby

PROSPEROUS OUTLOOK *(Continued)*

nies such as Computerland and Leading Edge and others. Gold Star, Samsung and other Korean computer makers also are battling foreigners for a share of their own domestic computer market. IBM and Hewlett-Packard Co. are among the 30 companies trying to sell systems to Korean businesses, which also are being pitched at heavily by Japanese computer producers.

Korean semiconductor makers, on the other hand, are coming off a tough year, when slack demand kept prices low in world chip markets. Nevertheless, they still are putting more money into research and development (R&D), and plant expansion.

Such investments may reduce Korea's reliance on foreign components. Korean electronics companies currently import more than 35% ($2.5 billion in 1986) of their component needs. Government and industry officials hope to bring the figure down to 24% by 1991.

Japan has been the chief source of foreign goods sold in Korea. More than 75% of Korea's electronics imports in 1985 came from Japan; the rest were mostly from the United States. During the 20 years between 1965 and 1985, in fact, Japan imports grew to account for 87% of Korea's $39 billion foreign trade deficit.

In 1986 alone, Korea's trade deficit with Japan was about $5.8 billion. If Japanese imports continue to grow at their current pace, they will reach $8.2 billion a year in 1990 — creating a $37.1 billion trade deficit during the five-year period. That would be larger than the deficit Korea had for the last 20 years with Japan.

Thus, the Korean government and industries are exercising their best efforts to reduce the trade deficit against Japan by searching for new sources of suppliers of technology, equipment and parts, and also by expanding their exports to Japan. This will certainly provide an excellent opportunity for American companies to do business with Korea.

Wan Hee Kim is chairman of WHK Industries Inc., a Palo Alto, California-based management consulting firm specializing in technology transfer, overseas investments and joint ventures in electronics in Asia. He also is an advisor to the Korea Electronic Industries Association, on which he has served as chairman of in the past.

Korea can't produce enough...

	Industrial products	Components
1986	$2.3 billion	$4.3 billion
1991	$6.4 billion	$8.0 billion

to keep up with exports...

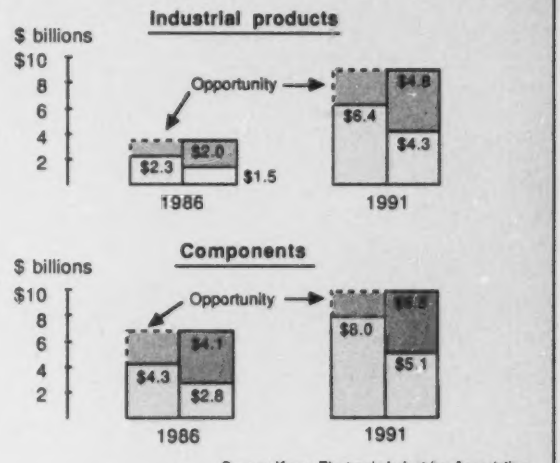
	Industrial products	Components
1986	$1.5 billion	$2.8 billion
1991	$4.3 billion	$5.1 billion

and satisfy its own domestic demands...

	Industrial products	Components
1986	$2.0 billion	$4.1 billion
1991	$4.8 billion	$6.5 billion

creating opportunities for U.S. suppliers to Korea

	Industrial products	Components
1986	$1.2 billion	$2.6 billion
1991	$2.7 billion	$3.6 billion



Source: Korea Electronic Industries Association

JAPANESE FOOTHOLD *(Continued)*

States. (The U.S. electronics trade deficit with South Korea was $1.2 billion in 1985.) But U.S. equipment manufacturers so far have not been able to match the aggressive equipment pricing of the Japanese, leaving little choice for Korean customers. It is simply a matter of economics for Koreans to do business with Japanese manufacturers.

No one — except the customer — is making money under these circumstances. Market-driven price competition does not and will not generate a normal profit unless manufacturing costs are brought under control — a daunting task in its own right. Controlling the costs of making capital equipment entails automation of manufacturing processes, which takes investment and time, as well as other productivity and inventory improvements. That is a tall order, especially for U.S. companies.

Over the years, U.S. industry has witnessed the erosion of its market share in textiles, steel and automobiles under the forces of foreign competition, mostly Japanese. The U.S. semiconductor industry may be next.

The United States, however, cannot afford to let foreign competitors take away the livelihood of its high-technology industry. It can no longer blame the Japanese for the astronomical deficit figures that seem to grow every month that they are announced.

Ready or not, the U.S. electronics industry is in the midst of a global trade war where old military strategies just will not work. The United States must arm itself with new strategies, ones that will endure the severest of competition — in Korea or on its own shores.

Young C. Kim is vice president of finance for Pacific Western Systems Inc. in Mountain View, Calif., which makes wafer probers, memory testers and vapor deposition equipment. Kim also serves as president of Pacific Western's Far East operations.

Semiconductors: The year of living dangerously

Consolidation, alliances, fickle markets and trade pacts have reshaped the chip business. There is more to come

By Alden M. Hayashi

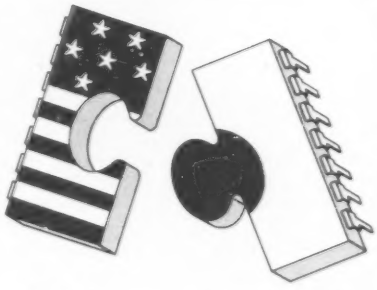
1986 was an eventful year for the leading worldwide semiconductor companies. The proposed Fujitsu acquisition of Fairchild and the Toshiba joint venture with Motorola highlighted the industry's move toward consolidation and alliances among the top players. The U.S.-Japan semiconductor trade pact agreement forced many companies to revamp their corporate strategies. And major swings in exchange rates shifted the competitiveness of companies doing business in foreign markets.

Perhaps the most intriguing event of 1986 was Fujitsu Ltd.'s announced intention to purchase 80% of Fairchild Semiconductor Corp. The proposed acquisition would move Fujitsu a few notches up from its current ranking of the sixth largest semiconductor vendor in the world. And the Fujitsu-Fairchild alliance would dominate the emitter-coupled logic (ECL) chip market with a worldwide share of nearly 50%.

Furthermore, the acquisition would propel Fujitsu to at least twice the size of any other Japanese semiconductor company doing business in the United States, says Wilfred J. Corrigan, chairman of LSI Logic Corp. of Milpitas, Calif. By buying 80% of Fairchild, Fujitsu also would have access to the various U.S. independent distributors which up until now handled few Japanese chips. If the acquisition is approved by the U.S. federal government, other Japanese corporations will attempt similar buys of U.S. companies, claims Corrigan. "It will have a domino effect," he warns.

Corrigan is not alone in his concern. Speaking at a luncheon for the New York Society of Security Analysts, Jerry R. Junkins, president and chief executive officer of Texas Instruments Inc., headquartered in Dallas, called this possible trend of Japanese buyouts "a bit disturbing." But, he added, "I wouldn't comment on whether it's the beginning of many or whether it's one of the few."

More palatable to U.S. companies was the announcement late last year of a joint venture between Toshiba Corp. and Motorola Inc., respectively the third and fourth largest semiconductor suppliers in the world. The venture calls for the establishment of a joint manufacturing operation in Japan where Toshiba will supply its memory chip expertise while Motorola transfers its microprocessor technology. Thus Toshiba gets to strengthen its weakness in microprocessors while Motorola gains memory-chip prowess. "We definitely have a need for the Motorola technology," says Bob Brown, a vice president of Toshiba America Inc. in Tustin, Calif. Motorola also gets to use Toshiba's memory chip know-how to start manufacturing dynamic random-access memory (DRAM) chips in the United States again. Several years ago, Motorola bailed out of the DRAM market because of aggressive competition from the Japanese companies.



1986 was an eventful year for leading semiconductor companies

Analysts call the joint venture a "win-win" situation. "Both companies basically got what they needed," says William J. McClean, analyst with Integrated Circuit Engineering Corp. (ICE), a market research firm located in Scottsdale, Ariz. Even competitors of Motorola and Toshiba cannot fault the alliance. "It's very hard to find anything wrong with the partnership at this time," says William Gsand, a vice president for Hitachi America Ltd. located in San Jose, Calif.

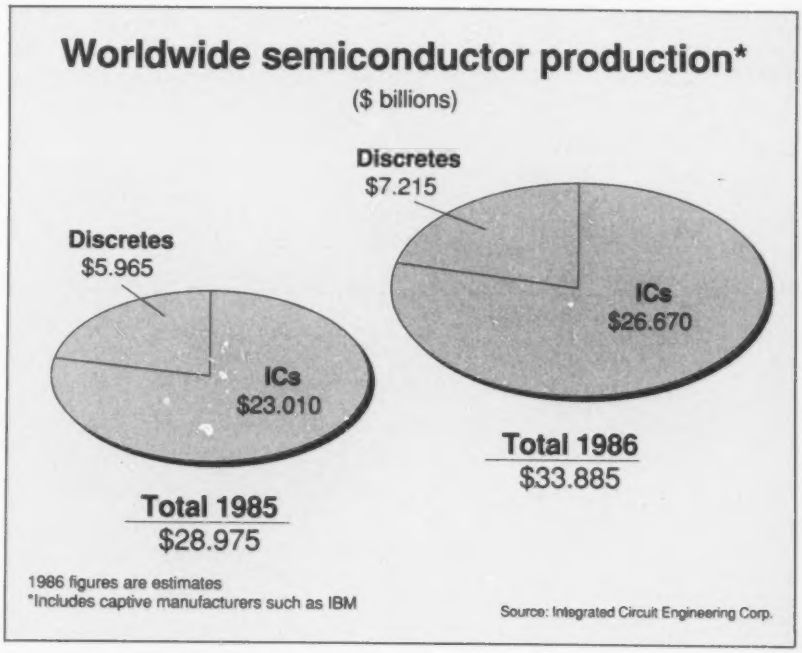
However, 1986 also marked the undoing of the RCA-Sharp joint venture, a partnership whereby both companies were to establish a joint manufacturing facility in the United States. General Electric Co., after purchasing RCA Corp., cancelled RCA's deal with Sharp Corp. Says ICE's McClean: "Somebody should pick up the ball on that." McCleans adds that "it could be a tremendous deal" for a company such as Advanced Micro Devices Inc. or National Semiconductor Corp.

McClean contends, "These types of deals and associations are going to be critical. The future is going to depend on strong alliances." Others agree. William Sick, formerly in charge of TI's semiconductor operations, explains that chip customers now want to do more of their business with a fewer number of suppliers in order to cut down on costs. Thus, says Sick,

customers will choose those suppliers with the most diversified and complete product lines. And in order for suppliers to broaden and fill their product offerings, alliances are all but required, according to James Norling, an executive vice president of Motorola. "I don't see how one guy can cover the whole waterfront by himself," says Norling.

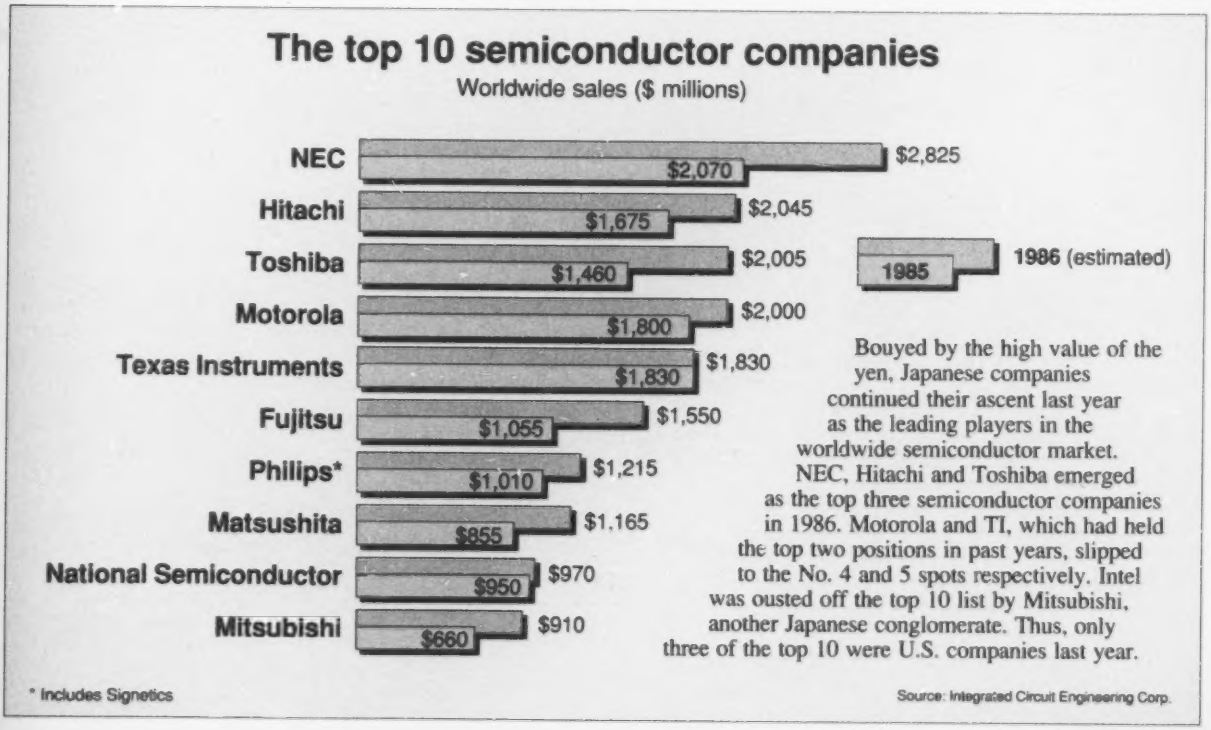
Toshiba's Brown adds that as the semiconductor industry continues maturing, competition continues intensifying. And with fiercer competition, leadtimes (the time between when a company first introduces a new product versus the time its competitor introduces a similar product) have shortened. As a consequence, companies are now finding it difficult to recoup their research and development (R&D) investments because they can no longer charge, for any substantial period of time, premium prices for new products, says Brown. So by working with their competitors, companies can then mitigate their R&D costs.

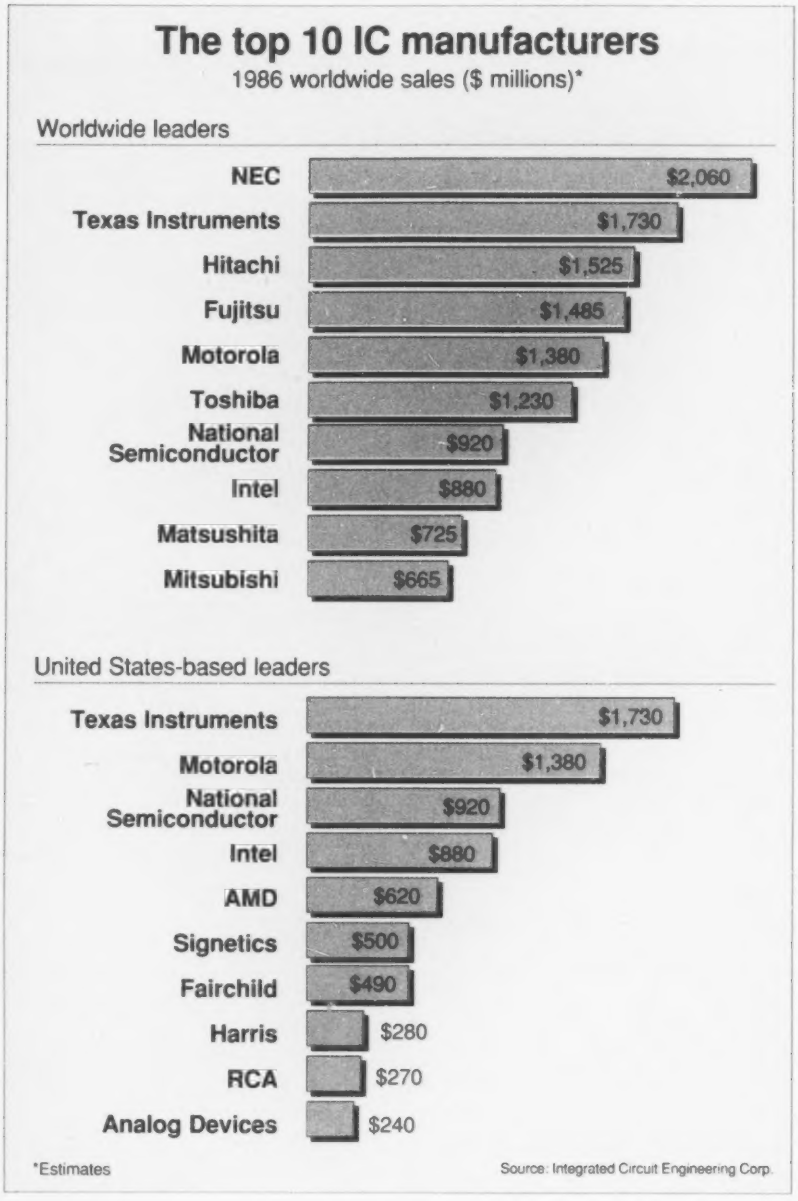
Alliances are also an effective way to penetrate foreign markets. For example, Toshiba reportedly will aid Motorola in the latter's efforts to sell into the Japanese market. Toshiba's help will be welcomed by Motorola which, for years, has had difficulty gaining a strong foothold in Japan.



Prowess in international markets will be necessary in the future, according to the ICE's McClean. "The producers that will do well are the producers that have a presence in Europe, Asia and the United States," he says. "I remember that just a couple years ago Intel [Corp.] said they saw no reason to put up a facility in Japan. That attitude has got to change."

It will, say many who see more competitive collaborations, such as the Toshiba-Motorola partnering, and more acquisitions, similar to the proposed Fujitsu-Fairchild buy-out, occurring in the future. "Only the tip of





the iceberg has been seen," asserts Toshiba's Brown.

Trade pact fallout

More alliances will occur in the future also as a result of the U.S.-Japan semiconductor trade pact agreement which was reached last summer. As a consequence of the agreement, Japanese companies are now more interested in increasing their manufacturing operations in the United States in order to avoid the price floors that the United States has set on certain chips that are manufactured on non-U.S. soil, thus Fujitsu's appetite to acquire Fairchild. At the same time, U.S. companies are interested in increasing their manufacturing presence in Japan in order to capture a greater share of the market there, which the Japanese government has promised, thus Motorola's partnership with Toshiba.

Because of the price floors, some Japanese companies are no longer competitive when selling certain chips in the United States. The yen's recent appreciation also has hampered Japanese companies by making their products more expensive outside of Japan. Indeed, says Toshiba's Brown: "We are effectively not selling any 256K DRAMs in the U.S. today. And basically our EPROM [erasable programmable read-only memory] business has gone to zero. The Japanese are essentially out of that market in the U.S."

But the semiconductor trade pact has not hurt all Japanese companies. By using its $100 million manufacturing plant in Roseville, Calif., NEC builds chips in the United States which are not subject to the price floors. "Roseville gives us a tremendous advantage," says Henry Josefczyk, a senior vice president for NEC Electronics Inc., headquartered in Mountain View, Calif. And because other Japanese companies do not have full manufacturing capabilities in the United States, Josefczyk adds: "The trade pact, to some degree, has had a favorable effect for us." NEC is planning to invest an additional $600 million to expand its Roseville facility by 1990.

The loss of business by Japanese companies in the United States has not been beneficial to all U.S. companies, many of which left the mainstream memory-chip markets years ago. To date, only Motorola, via its joint venture with Toshiba, says it will be reentering the DRAM market. "The trade agreement has sort of closed the door after the horse has left the barn," says Hitachi's Gsand.

Korean companies, particularly the Samsung Group, have taken advantage of the trade pact by selling chips in the United States at prices below the fair market values (FMVs), or price floors, set for the Japanese companies. "Somebody ought to apply dumping charges against the Koreans," says NEC's Josefczyk. He cites the pricing of the 256-kilobit DRAM, a workhorse memory chip of the industry, as an example. Although the lowest FMV is $2.50, one Korean company is selling that chip at a price below $2, asserts Josefczyk. Hitachi's Gsand estimates that Korean companies had no more than 2% of the U.S. 256K DRAM market a year ago. Today, the Korean companies now control from 10% to 20% of that same market, contends Gsand.

In addition to benefiting the Korean companies, the implementation of price floors in the United States has also made the gray market more active. Motorola's Norling says that for some types of chips, "we believe that the business that is being placed, is being placed in the gray market at below FMV prices." ICE's McClean

APRIL IN

Electronic Business

April 1

- Best Computer & Electronics Executives: Annual Poll
- Power Supplies
- Computers & Peripherals
- Semiconductors
- Plant Sites & Facilities
- Delivery/Shipping Services
- Automatic Test Equipment

Advertising Deadline: March 3, 1987

April 15

- Finance
- Connectors
- Military Electronics
- CAD/CAM/CAE
- Production/Process Equipment
- Plant Sites & Facilities
- Distribution
- Communications
- Components

Advertising Deadline: March 17, 1987

A CAHNERS PUBLICATION
275 WASHINGTON STREET
NEWTON, MA 02158
(617) 964-3030

If Fujitsu had bought Fairchild in 1985...

	Combined sales ($ millions)	Worldwide market share
Semiconductors	$1,512	6.2%
ICs	1,391	7.5%
Bipolar digital	596	15.9%
TTL	268	8.7%
ECL	323	47.5%
Other	5	12.7%
MOS	653	6.5%
Memory	416	10.8%
Micro devices	116	4.3%
Logic	121	3.4%
Linear	142	3.0%
Discretes	76	1.6%
Opto-electronics	45	3.7%

Source: Dataquest Inc.

says that the recent gray market price for one 256K DRAMs was between $1.75 to $1.90, significantly below the lowest FMV of $2.50. McClean adds that many Japanese companies are selling their chips in Japan to brokers who specialize in the gray market. Sometimes, McClean says, the chips will be sold six times before leaving Japan, making it difficult to trace their origin.

The trade pact has opened up market windows for some companies. ICE's McClean explains that although Toshiba was first selling 1Mb DRAMs, the company could not leverage its pioneering position. Usually, companies which are first with a new product have an advantage in that they are able to lower their pricing as they ship greater volumes. But because of the trade pact, Toshiba has not been able to drop its 1Mb DRAM prices quickly, says McClean. According to him, the price of a 1Mb DRAM chip should have been around $10 now. But because of the FMV price floors, 1Mb DRAMs are selling for around $20 each. As a result of prices decreasing slower now, Toshiba's competitors have an extra six months to a year to enter the market, says McClean.

When the trade pact agreement was first arrived at last summer, critics foresaw an exodus of electronics manufacturing from the United States to the Far East where chips would be cheaper. "The trade pact has made our U.S. customers say: 'If I have to purchase chips in the U.S. at higher prices, it's going to affect *my* competitiveness,'" says Toshiba's Brown. Adds NEC's Josefczyk: "We recently saw a customer, whose business to us was worth over $1 million a year, move his manufacturing totally to Hong Kong."

Hitachi's Gsand says that most of his larger U.S. customers that already have plants offshore have begun to shift more manufacturing there. Those companies had the flexibility to react quickly, says Gsand. On the other hand, small and medium-sized companies, many of which do not have factories offshore, were not so fortunate. These companies are now in the process of considering the move to the Far East, contends Gsand. According to Toshiba's Brown, a key question for those U.S. customers is: How fast will the U.S. government lower the FMV prices? The U.S. government has been reviewing and revising the FMVs on a quarterly basis. Brown adds that unless the FMVs decrease significantly, those U.S. companies will be moving their manufacturing offshore. □

Selling VLSI equipment in Japan tests U.S. vendors

U.S. test equipment makers have been singularly unsuccessful selling VLSI testers in Japan. So why do they persevere?

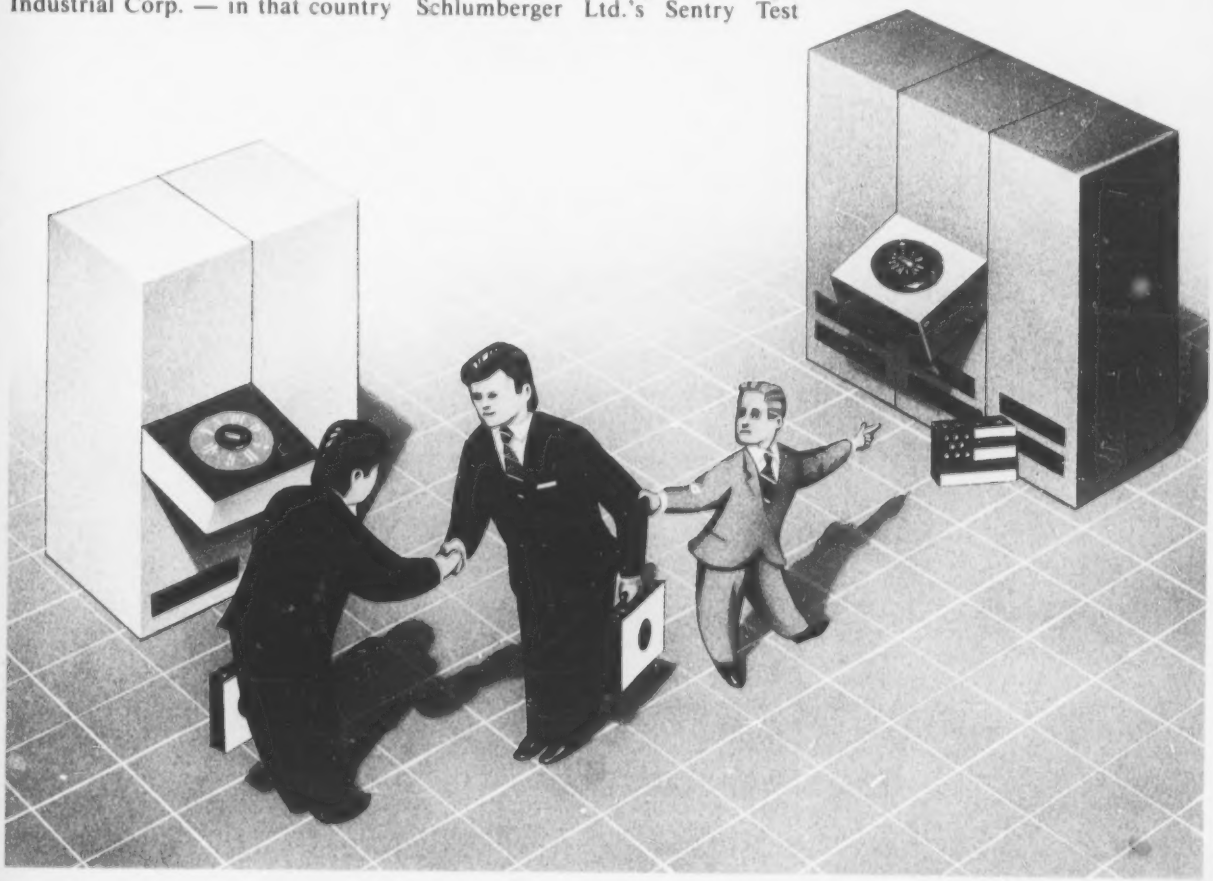
By Mark Mehler

In the last 2.5 years, U.S. suppliers of automatic test equipment (ATE) for very large scale integrated (VLSI) logic circuits have sold a grand total of one new-generation machine into the Japanese market — that being Trillium Corp.'s sale of a 256-pin, 60-MHz Arraymaster system to Mitsubishi Electric Corp. last year.

The failure, however, of American companies to unseat Japan's domestic VLSI test equipment suppliers — Advantest Corp. and Ando Electric Industrial Corp. — in that country has not yet proved disastrous. Last year, Japan only accounted for 29% of the $410 million worldwide market for VLSI testers, according to VLSI Research Inc., a market research firm in San Jose, Calif. The chief reason is that Japanese semiconductor companies, the country's chief customers of test equipment, have traditionally focused their efforts more on producing memory and other high-volume parts than on making VLSI devices.

Nevertheless, such U.S. hopefuls as Trillium (a subsidiary of LTX Corp.), GenRad Inc., Megatest Corp., Schlumberger Ltd.'s Sentry Test Group and Teradyne Inc. are currently battling for even the tiniest toehold in Japan. Why? "Japanese chip makers are getting serious about competing in application-specific ICs [ASICs] and other semicustom and custom parts," offers G. Daniel Hutcheson, president of VLSI Research. Those types of semiconductors require high-speed VLSI designs.

"There are good reasons to believe they [the Japanese] won't succeed, since flexible design and test software are the issues. And the U.S. still has



Marty Braun

the edge there," Hutcheson says. "But if they are successful, Japan should [represent] 45% of the worldwide VLSI tester market by 1990. No VLSI test equipment supplier will be able to ignore Japan and stay in business."

Aside from the potential dollars involved — the worldwide digital VLSI tester segment is expected to reach nearly $900 million by 1990 — this technology drives every other segment of the ATE industry. Thus, if the loss of Japan quickens a U.S. shakeout from the high-end logic test market, then it won't be long before America's dominant positions in testing linear ICs and printed circuit boards will come under pressure.

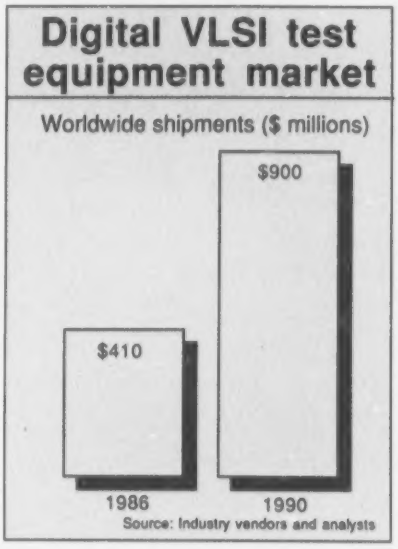
Hutcheson believes some U.S. companies, notably Trillium, bring something new and exciting to the Japanese VLSI tester market — specifically the ability to perform reliable tests on complementary metal-oxide (CMOS) chips. But neither he nor anybody else underestimates the awesome sales job facing foreign VLSI test equipment vendors. Some are calling it mission impossible.

"It's utterly futile," argues James Bowen, president of Attain Inc., a linear tester manufacturer in San Jose. "Ando and Advantest have worked closely with users since the late 1970s. Now, after eight years, U.S. companies are saying, 'We're back,' and the response is: 'So what?'"

The only time a Japanese electronics company buys a foreign product is when there are no suitable alternatives in Japan, Bowen says. Schlumberger and GenRad had their chances, he notes. If Sentry had been able to execute years ago on the (high-end) Series 50, or if GenRad had not missed the window back in 1981, it would have been different. "As it is," Bowen says, "even a U.S. vendor with a truly unique machine has an uphill fight."

Jay Cooper, an analyst with Eberstadt & Fleming Inc. in New York City, says that it is much too early to look for major sales of U.S. VLSI testers into Japan. "A few heads are turning in the user community there, but the prejudice against U.S. equipment is strong," says Cooper. He believes that it will take at least two to three years for American vendors to convince Japanese customers that they are in the business to stay.

Adds another pessimistic observer: "When Advantest started shipping 100-MHz systems six years ago, it created a perception of Japan as the technology leader. Actually, their systems are faster and they never go down, but historically, U.S. equipment has better system accuracy, better ability to operate at low machine capacitance for CMOS, and easier to use applications software. Despite all of that, the Japanese vendors seem to have things pretty well sewn up. Maybe a U.S. company that can differentiate its product can manage to confuse enough people to sell a few systems."



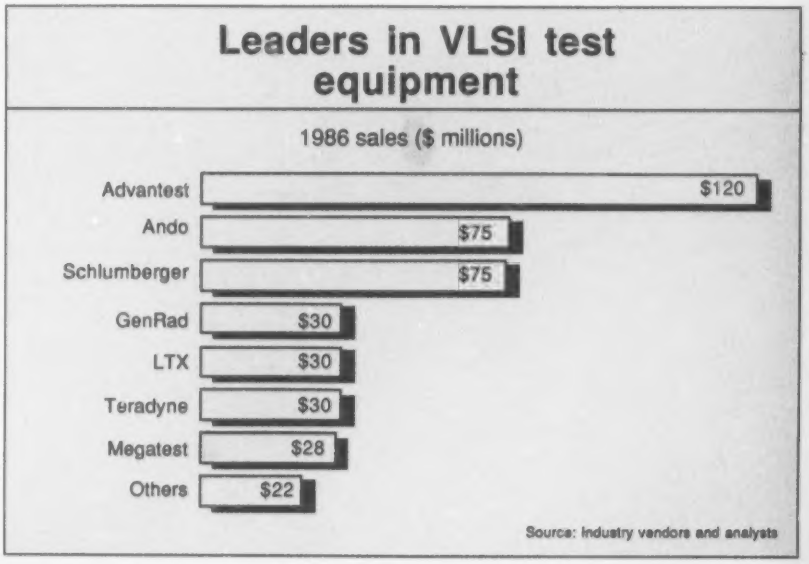
Vendors are optimistic

James Healy, the president of Trillium, agrees that leading-edge system architectures impress Japanese customers. His company, for example, touts its tester-per-pin construction, in which each test pin has its own memory, timing and formatting capability. However, Healy believes two other factors will weigh far more heavily on the future of U.S. VLSI testers in Japan.

"Because Japanese customers always want you to do some hardware or software modification, like adding a little higher current, you have to have full engineering resources there," insists Healy. "Second, when the Japanese plan a multimillion-dollar tester buy, they always look ahead. You have to show them the future. Most of all, you need a stable organization. We have 70 of our own people in Japan, and we think we have the required design capability over there."

The Trillium president sees some 90% of Japan's VLSI tester market as open to foreign suppliers willing to commit resources. He willingly concedes the other 10% to high-speed Japanese equipment optimized to test custom and semicustom parts that go into mainframe computers. Healy, in particular, believes U.S. test equipment vendors stand a fair chance of cracking second-tier accounts such as Ricoh Ltd. and Sony Corp., companies with growing in-house semiconductor operations. "They previously depended on large merchant IC makers, but now the systems people [at those companies] are doing more design work of their own and may be open to buying American equipment."

Teradyne executives contend that the key to success in Japan is selling a full ATE product line. Edward Rogas, vice president and general manager of Teradyne's Semiconductor Test Group in Woodland Hills, Calif., says



ATTENTION VENTURE CAPITALISTS

ELECTRONIC BUSINESS magazine is preparing its annual directory of venture capital firms. We need your assistance to make sure the directory is timely and accurate. If you are a venture capitalist, or work for a venture capital firm, please fill out the following form and return it to us by April 1. Mail to:

Nancy McSharry
Assistant Editor
ELECTRONIC BUSINESS
Venture Capital Directory
275 Washington Street
Newton, Mass. 02158-1630

ELECTRONIC BUSINESS
Venture Capital Directory

COMPANY NAME

COMPANY PRESIDENT

STREET ADDRESS

CITY

STATE ZIP

TELEPHONE

ELECTRONIC BUSINESS
275 Washington Street
Newton, Mass. 02158-1630
(617) 964-3030

that Japanese customers care more about prices and vendor stability than about pure system specifications. In addition to its Japanese installed base of memory, linear and backplane testers, Teradyne has sold several older 941 VLSI machines in that country and has a line of VLSI systems priced from $500,000 to $3 million.

"We've got organizational strength with our own company [Teradyne KK] in Japan staffed by 200 Japanese nationals," boasts Rogas. "This is what users need to see. Certainly we expect our J953 per-pin system to compete with Advantest for the high-pin-count 32-bit, RISC [reduced instruction set computer] chips, but for 140-pin ASICs, you don't need all that capability."

Role of trading partners

Neither Megatest nor GenRad operates in Japan through its own subsidiary. Megatest is represented by Japan LSI, and GenRad has a joint marketing venture with Tokyo Electron Ltd. Both vendors insist, however, that having a Japanese partner is the best way to gain credibility.

"JLSI gives us enough of an engineering base there," says Richard Carmichael, sales director of San Jose-based Megatest Corp. But he concedes that the $34 million company has a difficult task persuading Japanese users that Megatest will be around for awhile. The task is even harder when Megatest is compared with companies such as Teradyne that are much older and bigger and with companies like LTX that have demonstrated in Europe that they can service a foreign market.

"We are told repeatedly that they feel our per-pin system matches all their dreams and desires for easy to write software for CMOS gate arrays, ECL [emitter-coupled logic] and MPUs [microprocessor units]," says Megatest's Carmichael. "But do they have faith in our longevity? . . . That's a key problem for us."

It is not a problem for GenRad, which has installed 100 VLSI testers worldwide. "I have found that having a healthy installed base is a very important advantage in Japan," says Gene Roth, marketing manager for GenRad's Semiconductor Test Division in Milpitas, Calif. GenRad, a few years ago, sold a couple of its older VLSI machines, the Models 16 and 18, to Hitachi Ltd. and Oki Semiconductor. And Roth believes the relationship with TEL gives GenRad sufficient application support to sell the new 60-MHz Model 180 to Japanese ASIC and 32-bit microprocessor manufacturers.

Schlumberger's Sentry unit is widely seen by analysts as the least likely of the U.S. entrants to make a mark in Japan because its flagship VLSI test product, the Model 50, was late to market and built on what some regard as an old tester architecture. The company, similar to GenRad and Japanese test equipment vendors, offers a conventional shared-resource system in which tester channels share memory and formatting functions. A Sentry spokesman, acknowledging that the Model 50 was delayed several years, argues that Japanese users have been comfortable with conventional architectures and are unlikely to gravitate to the newer per-pin systems en masse. The Sentry source further insists that the company's direct sales presence in Japan proves that they are giving serious attention to that market.

Other factors in U.S.'s favor

Japan's currency woes, also, could act in favor of the U.S. VLSI test equipment vendors. The appreciation of the yen against the dollar has made American-made equipment cheaper to buy in Japan. The yen's rise also has accelerated plans by Japanese electronics companies to move some production outside of Japan. As more and more large Japanese companies shift production to offshore sites, securities analyst Cooper reasons, more tester-buying decisions could be made in such places as Korea and Taiwan where prejudices against U.S. equipment are not so powerful. Of course, it will be many years before other Asian countries are far enough along the learning curve to make use of sophisticated VLSI logic testers.

Finally, some words of hope come from Kenneth Van Egmond, supervisor for test applications for VLSI Technology Inc., a Silicon Valley ASIC manufacturer that recently committed to Megatest's MegaOne. Van Egmond suggests that in their home market, at least, U.S. VLSI test equipment vendors have a lot going for them. "For us, it was a matter of establishing working relationships. We looked at Ando, which is opening a software center here, but the hardware is over there. In terms of offering links to CAE [computer-aided engineering], we also don't see Japan moving very fast. Keeping it within the local community is still an important consideration in the U.S." □

The bottom line on tax reform

Corporate America will pay for tax reform, but with careful planning in 1987 there are ways to lessen adverse effects

By Bruce C.P. Rayner

Simplification, fairness and efficiency were the primary goals of Congress when it set out to revamp the tax code last year. But when the smoke cleared, simplification was nowhere in sight and fairness had been compromised for expedience and revenue neutrality. As for efficiency, it is still too early to say, but both economists and accountants do expect business decision making to be based more on economic rates of return than on tax breaks.

Tax experts say that for businesses, the two most important positive consequences of the Tax Reform Act of 1986 will be the lowering of the top corporate tax rate from 46% to 34%, as of July 1, 1987, and the three-year extension on the research and experimentation (R&E) tax credit (the latter being particularly relevant for many segments of the electronics industry). These advantages are, however, offset by a host of disadvantages. The more significant of these are the increase in the capital gains tax rate from 20% to 28% making it equal to the new top individual tax rate; the repeal of the investment tax credit (ITC), a credit of between 4% and 10% on certain property; and the lowering of the R&E tax credit rate from 25% to 20%. Other negative effects include: the alternative minimum tax (AMT) that requires an additional set of books to be kept; changes in employee compensation packages; and changes in the tax structure for some foreign assets and subsidiaries.

How the Tax Reform Act of 1986 affects the electronics industry depends on the specifics of the company in question, but experts agree that high tech came off pretty well. However, some changes in the way business is conducted could take place, especially for capital-intensive companies like semiconductor manufacturers. The increased cost of capital is caused mainly by the higher capital gains rate and the repeal of the ITC. The capital gains rate increase raises the cost of equity while the repeal of the ITC raises the cost of plant and equipment. For capital-intensive companies this means either postponement of investment or buying equipment offshore. It also means that leasing equipment is now more expensive.

Experts agree that high tech came off pretty well

For start-up companies and research and development firms, venture capital will be harder to come by.

For noncapital intensive companies, such as software companies, tax reform is generally favorable and certain provisions benefit start-up companies as well. The lower corporate tax rate, the extension of the R&E tax credit and other provisions -- like the exclusion of software revenue of "active software companies" from classification as personal holding company income and the exclusion of research spending as a tax preference item — are all positive changes.

Coopers & Lybrand, one of the Big Eight accounting and tax firms, believes that military contractors will be the hardest hit of all high-technology segments. New accounting rules will no longer allow contractors to postpone their total tax payments until completion of the project. Now, only 60% of the tax can be deferred, with the remaining 40% due in the year the income is earned.

Steven Burrill, chairman of the high-technology group of Arthur Young, the international accounting, tax and management consulting firm, is optimistic. He downplays the impact that the lower R&E tax credit; the higher capital gains tax; and the repeal of the ITC will have on electronics companies. The R&E credit is still in place, he says, and the lower rate is inconsequential because of the now-lower corporate tax rate it must offset.

As for the higher capital gains rate, in the past there was a strong incentive to invest because the capital gains tax was 30 percentage points lower than the top individual tax rate of 50%. Now that the two are both 28%, the tax advantage has been removed and the only rationale for venture capitalists is economics. However, Burrill does not expect capital formation to be much affected by the change in the capital gains tax rate.

"The loss of the ITC to technology companies is of some concern," Burrill says, "but to a large extent the technology companies are less capital intensive, except the big semiconductor manufacturers, than other aspects of the American economy." It is the ailing semiconductor segment of the market that has many in the electronics industry worried, and tax reform is only another complication.

But Dataquest Inc., the San Jose, California-based market research firm, found in a survey of semiconductor manufacturers that their investment plans would not be affected

by the repeal of the ITC, perhaps because of their other woes. Similarly, the market research firm reported that computer equipment makers do not see the new tax bill adversely effecting their business in any significant way.

Based on the survey, Dataquest concluded that although the repeal of the ITC will not stop investment, it will influence where that investment is made. "In keeping with a shift in the economic center of gravity toward the Pacific, large capital investments will more likely be made in Penang, Singapore, and Seoul, than in Santa Clara, Austin and Kokomo," says the Dataquest report.

Erosion in manufacturing

But not all are as positive as Burrill and Dataquest: "Given the tax reform environment, and many other [economic] factors, there is not a great deal to be optimistic about in terms of the [international] competitive situation for either the high-technology industry or its customers," says Ray Stata, chairman and president of Analog Devices Inc., the Norwood, Massachusetts-based manufacturer of components and subsystems. Stata is worried that, because of the shift in the tax burden from the individual to the corporation, the international competitive position of American manufacturing will be further eroded.

Stata insists that his company will not fare too badly under the new tax bill, but, at the same time, he expects the economy to suffer as a result of lower corporate savings rates that lead to lower levels of investment. Without adequate national savings, much of which is done at the corporate level, a much needed increase in investment is just not possible. "It is clear enough," Stata says, "that we are in an unsustainable mode in terms of both the [federal] borrowing and the trade deficit. There is nothing about this tax package that will do anything other than make that worse."

The Department of Commerce, in its December 1986 survey of planned new plant and equipment expenditures, paints a dismal picture of expected capital investment (but not necessarily as a result of tax reform). Manufacturing as a whole is expected to spend $141.95 billion for new plant and equipment in 1987, 2% less than in 1986. The electrical machinery segment is more healthy at a 5% planned growth rate in 1987, up from an 8.5% decline in 1986.

Weighing up the pluses and minuses, most economists are not quite as pessimistic as Stata in their expectations of the effects of tax reform. Many predict that the economy will not be too badly jolted by tax reform in the short run. However, for the longer run, concern over a worsening federal deficit and a deepening national debt are very real.

Lester Thurow, an economist at the Massachusetts Institute of Technology (MIT), does not expect any perceptible change in either interest rates or GNP growth as a result of tax reform over the next few years. But when asked whether he thought the bill would be revenue neutral, (that is, there will be no net gain in revenue over the long term) as Congress expects, he says, "Don't believe it for a minute."

The bill loses money for two reasons, Thurow says: First, revenue increases in the first year (1987) but then will decrease in the next four years; and second, he thinks that Congress has "grossly overestimated" how much revenue they are going to get by closing some tax loopholes. "If you think about balancing the budget in 1990," Thurow says, "you've got a bigger problem than you do under the current law." In total, Congress expects to raise an extra $122 billion over the next five years.

As for capital formation, Thurow

Some critical comments on tax reform

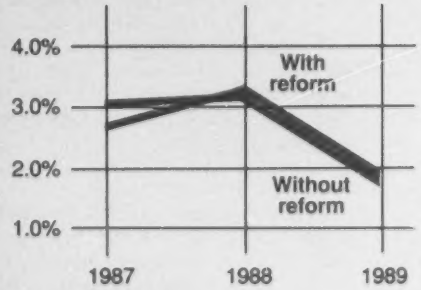
Anthony Spohr, Price Waterhouse: "In my view, this whole thing was thrown together in such a rapid fashion, with such an incredible fixation on reduction in rates without any real assessment of the total implication of all these changes."

Jay Yost, Coopers & Lybrand: "I think my clients are concerned that the tax laws change every other year. What we need is some stability in the tax laws so we can understand what the tax consequences are and then adjust our business accordingly. What we need most of all is certainty."

Ray Stata, president, Analog Devices: "It is clear that we are in an unsustainable mode in terms of both the borrowing and the trade deficit and there is nothing about this tax package that will do anything other than make that worse."

What to expect: The short-term forecast of tax reform

Real GNP growth
(Annual percentage growth)



Effects of tax reform:

Year	GNP with reform	Capital equipment spending with reform	High-quality corporate bond rate: with reform	High-quality corporate bond rate: without reform
1987	0.4% lower	2.8% lower	8.15%	8.60%
1988	0.3% lower	4.9% lower	8.69%	8.94%
1989	0.2% lower	5.1% lower	8.39%	8.68%

Source: Data Resources Inc.

predicts it will be a little lower under the new tax code. But what is lost in quantity of capital investment, he says, will be made up for in quality of investment. "We've been wasting a lot of capital in real estate developments we didn't really need and so if they go down, no great loss," he adds.

Nigel Gault, a senior economist at Data Resources Inc., agrees with Thurow about a lower level of capital formation but differs on both GNP growth and interest rates. He sees both as being slightly lower under tax reform. However, Gault supports Thurow's view that, in the long run, the federal budget deficit will be made worse by tax reform as a result of a failure to meet projected revenue goals. Gault believes that Congress failed to account for economic structural change when it calculated expected tax revenue for the next five years.

Senior tax manager at Price Waterhouse in San Jose, Anthony Spohr, agrees with Gault: "When people realize what they are up against, they are fairly inventive and ingenious. They will figure out ways to live with it all [tax reform], but it will take a fair amount of restructuring in order to be able to do that," he says. Although many corporate tax consultants were frantically recommending changes to their clients that should have been made by the end of 1986, there are still many adjustments that can be made in 1987 and beyond.

S corporations

One recommendation that many of the Big Eight suggest to their corporate clientele, is to opt for a Subchapter S election. Unlike a regular corporation that will be taxed at a 34% maximum rate on corporate income before distribution, an S corporation, as it is called, is taxed only once at the shareholder level at a maximum individual tax rate of 28%. Because it is the first time in history that the individual tax rate has been lower than the corporate rate, electing S corporation status makes a lot of sense. Because of the lower tax rates that S corporations have to pay, the revenue-generating potential of tax reform might not fulfill Congress's expectations. In that case, assuming a Gramm-Rudman budget environment, across-the-board budget cuts would be required.

But there are limitations to electing S corporation status: only companies with less than 35 shareholders; no more than 80% ownership in a subsidiary; no nonresident foreigners as shareholders of the company; and only one type of stock can take advantage of this corporate structure.

There are some additional costs of converting to S corporation status after the end of 1986, but many believe that it remains a good deal *if* a company can qualify. Charles Hutchinson, president of the Massachusetts Association of Public Accountants, and president and tax partner at Beers and Company Inc., thinks that it will still be a desirable adjustment in the coming years. "This Sub S movement is far from over," he says, "I think it has only begun."

ANALOG DEVICE's STATA: "We are out of step with the savings rate that it takes to produce the investment in productivity we need"

How many companies opted for S corporation status in 1986, no one seems to know. The Internal Revenue Service (IRS) claims it will not know until early 1988 and no one else is willing to hazard a guess. As for tax consultants, Spohr, at Price Waterhouse, says he sees a lot of high-technology companies talking about it, but few following through.

The AMT advantage

Another advantage of electing S corporation status is that under tax reform, they are not subject to the 20% AMT rate. The new alternative minimum tax, an incredibly complex calculation, is based on taxable income plus certain deductions and deferrals and certain tax preference items. If this exceeds the regularly calculated tax, the company pays the higher of the two.

"The harder you try to save taxes by reducing your regular tax liability," says Spohr, "the more you aggravate your exposure to the alternative minimum tax." The result is that a company might end up paying more under the AMT than under the regular calculation.

The AMT will not affect high-technology companies any differently than other companies. But one area that will have to be examined carefully is in the calculation of book untaxed reported profits (BURP) adjustments. That is, 50% of the difference between book and taxable income will have to be included in the adjustment for AMT. In the past, Spohr says, accountants have worked hard to try to make the gap between financial statement income and taxable income as wide as possible. But now, "the harder we work, the behinder we get," he quips.

Another little-known fact about the AMT is that all corporations (excluding S corporations), whether they are subject to the AMT or not, will have to calculate it in order to determine their contribution to a new Superfund tax — a 0.12% tax on corporate alternative minimum taxable income in excess of $2 million slated to be used to clean up the environment. As indicated by Harvey Fireman, senior tax manager at the Boston office of the accounting firm of Ernst & Whinney, the new Superfund, not a part of tax reform, is effective for all tax years after 1986.

For example, if a corporation had income of $12 million, the tax would be $12,000. "Twelve thousand in relation to $12 million is not all that great a deal, but the record keeping burden to get there is pretty significant," comments Fireman. As spelled out in Ernst & Whinney's tax notes of last October: "This new [Superfund] tax is imposed whether or not the corporation is subject to the alternative minimum tax, and whether or not it produces toxic waste."

Rewards for labor

One area of tax reform that might affect electronics more than other industries is employee compensation. Now that the capital gains tax rate is equal to the individual income tax

Bryce Flynn/Picture Group

rate, the advantage of payment in equity, such as stock options and profit sharing, is less desirable. "I tend to think people will want more cash," says Fireman. For smaller start-up companies, this could put pressure on an already tight cash flow, and in some cases disqualify some companies from attracting top grade people.

But Fireman believes that people will still be attracted to high-tech investment because of the stock, despite the less desirable tax incentives. But an executive's decision to join a company will now be based more on economic than tax considerations.

"I think every high-tech company has to review its compensation plan now to see how it fits under the new tax law," says Jay Yost, a Boston-based tax partner with Coopers & Lybrand. "Pure equity-based compensation plans may not make sense any more." One victim of tax reform is the incentive stock option (ISO), the issuance of stock to employees as payment. Because of the higher capital gains rate, says Yost, "ISOs lose a lot of their appeal."

Furthermore, Fireman points out that the Financial Accounting Standards Board (FASB) is considering proposing a rule that would affect the income statement of companies issuing ISOs. On the day the company issues the ISO, says Fireman, the company would have to expense the difference between the present value of the projected stock price and the issuing price. As a result, ISOs would become more complex to issue. Fireman says the considered proposal might be up in front of the FASB in the first half of 1987. But industry is fighting hard to kill it, he says.

"For a small company struggling to make it, [the FASB proposal] is going to depress earnings. The consequence of that is the possibility of not being able to attract private capital, maybe not being able to do a public offering and not being able to qualify for any kind of debt from banks. Basically, it is an unfavorable result that could kill ISOs," says Fireman.

International shocks

Tax reform may have a profound effect on how electronics companies do business overseas largely as a result of what is called the "super royalty." In the past, the IRS has charged companies a license fee on royalties from technology transfers overseas based on a one-time-value of the product being transferred. Now, Congress wants the IRS to be able to revalue the royalty, and the license fee it charges, whenever it sees fit. High-technology companies are now caught between two governments: the United States, on the one hand, wants more tax revenue from foreign income to be brought back, while the foreign government wants the income to stay in its own country.

MIT's THUROW: Revenue neutral? "Don't believe it for a minute"

I don't think it [the super royalty tax] is a very wise idea," complains Coopers & Lybrand's Yost. "Foreign countries aren't going to stand by and watch the U.S. simply take profits out of companies operating in their countries. You have companies that have enough problems anyway operating abroad, [now they are] operating under this uncertainty," he adds.

Other international issues that introduce uncertainty are the shift in relative tax rates between countries and the changes this has on the foreign tax credit (FTC) limitation — the amount of foreign taxes paid that can be credited against a company's U.S. tax liability. The United States now has one of the lowest tax rates in the world, so it could be more advantageous to have income taxed in the United States instead of overseas. It also means that, now, excess foreign tax credit could be lost.

Advice for U.S. companies doing business overseas from Ernst & Whinney's Kent Schreiner, senior tax manager in the international tax department, is to review transfer pricing policies and restructure transactions in order to take advantage of the relatively low U.S. tax rate. He thinks that U.S. companies doing business overseas should review their entire international structure in order to shift income to the United States and to other low-tax countries (such as Ireland), try to maximize the FTC limitation and to become learned in the new rules and calculations required by tax reform. The international side of tax reform, Schreiner says, will see much activity in 1987 and 1988 as companies restructure their global operations.

What long-term global effects tax reform will have is still too early to tell. But it could mean more foreign interest in U.S. plant sites, and more manufacturing onshore. On the other hand, it could trigger retaliatory action from Europe and the Far East that could introduce even more uncertainty into the international business world. □

What plans for 1987?

Survey of business spending on new plant and equipment*

	Change from previous year			
	Actual		Planned	
	1984	1985	1986	1987
All industry	16.3%	9.2%	-1.7%	0.9%
Manufacturing	19.5%	10.6%	-5.7%	-2.0%
Electrical machinery	27.9%	5.9%	-8.5%	5.0%
Nonelectrical machinery	14.1%	3.7%	-13.8%	-7.0%

* Survey conducted in October and November of 1986. Capital spending changes not necessarily due to tax reform.

Source: Bureau of Economic Analysis, U.S. Department of Commerce

A SPECIAL REPORT
DOING BUSINESS IN
CHINA

The fifth tiger of the Far East

China continues to import computer and electronic equipment from the West. But can it make it in the export market?

By Al Furst

This April, the government of China will start to implement a series of reforms aimed at improving the investment climate for U.S. electronics companies and other foreign investors. China's decision to offer preferential treatment to high-tech companies comes none too soon.

The bloom is off for many U.S. electronics companies which were expecting to reap a harvest in high-tech sales this year. [ELECTRONIC BUSINESS, March 15, 1986 p105]. Due to a sudden shortage in foreign exchange — too much money spent in too short a time on too many Japanese automobiles and other consumer durables — China last year sharply cut its previously proposed spending for computers, communications and other Western electronic equipment.

While U.S. electronics exports to China rose a modest 12.2% for the first nine months of 1986, compared with the first nine months of 1985, China's electronics purchases were nowhere near the staggering 50% to 100% growth rates of previous years. At the same time, overall industrial production slowed to 6% last year, from 18% in 1985.

Hardest hit in the currency crunch were Japanese computer and telecommunications manufacturers whose products became less attractive to Chinese end users as the yen soared in value in relation to the dollar. In 1986, Japan saw its market share in computers shrink to 36%, from 53% the previous year. At the same time, U.S. market share rose to 54%, from 32%, according to Roger W. Sullivan, president of the Washington, D.C.-based National Council for U.S.-China Trade, a nonprofit trade group. The Japanese also lost market share in telecommunications, Sullivan reports, primarily to the Europeans.

Ira Kirschenbaum/Stock Boston

Most major U.S. corporations appear to be committed to maintaining at least some kind of presence in China

Add to this a host of problems peculiar to China — price-gouging, an extremely high cost of living for foreign expatriates, red tape, strict U.S. export controls and the inability in many cases to repatriate profits earned on Chinese soil — and there was plenty of reason for Western high-tech companies to cut and run. In fact, a number of larger companies, including IBM, recently have scaled back operations in China.

It is difficult to make generalizations, however, because some U.S. electronics companies are still doing extremely well in China. Apollo Computer Inc., for example, sold $5 million worth of workstations on the mainland last year, partly through a original equipment manufacturing (OEM) deal with the Calma division of General Electric Co. On that basis, the company decided to expand its Hong Kong-Shanghai-Beijing operation to 20 sales and service personnel. "We increased sales by 100% in 1986," says Steven Weinberger, director of international marketing, "and while we don't think we can keep that growth rate up, we'd sure like to see something in the 50% range this year."

Student demonstrations

Most major U.S. corporations appear to be committed to maintaining at least some kind of presence in China, the recent student demonstrations in several Chinese cities notwithstanding. Indeed, there may even be a positive side to the student demonstrations, suggests H. Charles Langford, president of China/Tech, a joint venture consultancy between Technology Clearinghouse of China, part of the Chinese Association for Science & Technology, and Atlanta-based Technology Exchange Corp. Langford, whose clients include Apple Computer Inc., says the very fact that Chinese newspapers have made note of the unrest and are willing to permit foreign journalists to photograph it indicates "increasing openness to the West."

Moreover, long-term prospects for trade in computers and communications, scientific instrumentation and durable machinery remain good, says David Laux, President Reagan's advisor on China at the National Security

Council. China, he says, looks at the "economic miracles" that have occurred in the other "four tigers" of Asia — Hong Kong, Taiwan, Singapore and South Korea — over the past 10 years. In three of those four high-tech hotspots, those "miracles" were performed by ethnic Chinese. With the proper infrastructure, Laux says, China believes it can duplicate those successes at home, and one day compete with its Asian neighbors in the global market.

But even though China has a long way to go before it wants to become Asia's fifth tiger in the Far East, there are signs that the cub is stirring in its lair. Right now, for example, reports Liu Dan, general manager of the Shanghai branch of the China National Import & Export Corp., there is a group of consumer electronics companies in Shanghai, called the Panda Group, which has set its sights on the world market. Panda, which makes low-priced radios, televisions and tape recorders primarily for internal consumption, wants to compete with Goldstar and the Samsung Group of South Korea, Liu says. The designs, he admits, are "a bit old-fashioned," but Liu believes it will only be a matter of time before Panda streamlines its product line and starts hunting for outlets in the West.

Meanwhile, China continues to experiment with some aspects of capitalism. And because high tech is absolutely vital to China's modernization effort, some of the first reforms have been aimed specifically at equity joint ventures involved in electronics. In addition to "technology transfer," China hopes these high-tech companies will also generate needed foreign exchange for China's depleted coffers.

The new economic reforms, which were officially promulgated last October, will start to take effect this spring, as the nation's vast network of provincial and municipal bureaucracies starts to translate the central government's reform edicts into action. Political reforms, to which recent student demonstrations have been a kind of prelude, are expected to be announced this October at the next Communist Party Congress.

Many veteran China watchers are skeptical that life will get any easier for U.S. corporations in the years ahead

Most analysts believe that as the reform movement strengthens, U.S. businesses will be in a better position to justify investing in China. Under the current labor management system, for example, most U.S. companies have to take whoever is assigned to them, and dismissals are difficult, if not impossible. The reforms could change all that. In addition, wage rates at joint ventures are expected to become more competitive with local wages.

At the same time, joint ventures have gotten approval to begin swapping currency among themselves. This will make it easier for U.S. firms to repatriate profits. High-tech firms also will become eligible for preferential tax treatment and land-use fees and given favored access to scarce resources like electricity and purified water.

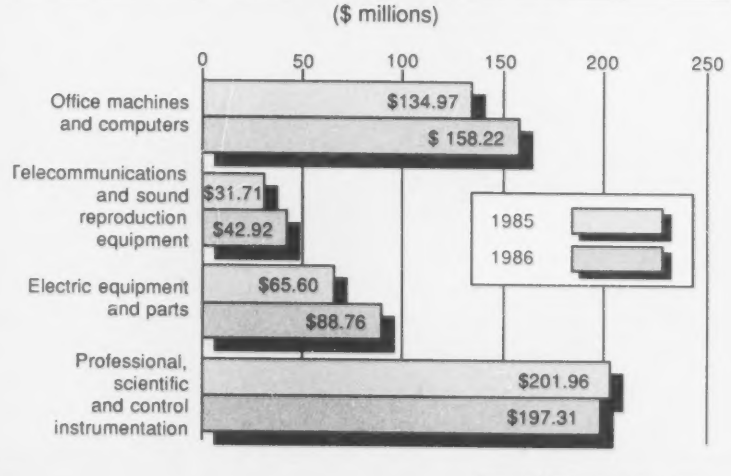
Also, as part of the new policy, China is expected to increasingly provide foreign exchange for the first time to manufacturing ventures which have been designated as "import-substitution companies," so called because they manufacture products that would otherwise have to be imported. These companies will receive foreign exchange for sales instead of local currency which cannot be converted on the world market. And if China has to borrow money from the West to achieve some of these objectives, it will, analysts say — be another departure from prior policy.

Part of the reform process too is aimed at promoting younger, college-trained, Western-oriented individuals into key positions in the bureaucracy. "In virtually every city, you now have around the mayor a number of vice mayors with specific responsibilities, including high-tech and other emerging industries," adds Sidney Rittenberg, the former head of ComputerLand China franchise and now president of the Los Angeles-based consulting firm, Index/China, a division of Index Systems Inc.

At the next Party Congress, others say, there may be even some discussion about putting factory managers in charge of the actual factories they are supposed to be managing. Under the current system, the Party secretary attached to each work unit has more authority in economic matters than the factory manager.

In all likelihood, future guidelines implementing economic reform will be published periodically throughout 1987, according to Gu Mu, head of China's cabinet-level State Council

The pace of U.S. electronics exports to China in the first nine months of 1986



Source: U.S. Commerce Department

Leading Group on Foreign Investment. The most difficult set of guidelines — dealing with currency conversion — will probably be the first to be published, state councillor Gu recently told a high-level delegation of U.S. electronics executives.

In addition to national reforms, many local municipalities have also tossed in a few reforms of their own. Shanghai's Yangtze delta region, for example, which accounts for one-third of China's total high-tech production, is instituting a whole series of local reforms to attract additional foreign capital and improve conditions for foreign joint ventures. The reforms are being welcomed by U.S. firms already in operation there, including Shanghai Foxboro Company Ltd. and Wang Computer Industry Development Company Ltd.

"We are aware of the complaints that our American friends have," says Liu Zhen-yuan, Shanghai's vice mayor for electronics and emerging high-tech industries, "and we're trying to do something about it." Liu is currently in the process of setting up a new computer science university in Shanghai to provide graduates for foreign joint ventures.

Many veteran China watchers, who have lived through other so-called "reform movements" in the past, are skeptical, however, that life will get

Wang Labs sets up a joint venture in Shanghai

After several abortive attempts, Shanghai-born An Wang, founder and chairman of Wang Laboratories Inc., last year finally set up a joint venture in China to manufacture desktop computers.

Wang, who fled his homeland in 1948 during the civil war that brought the Communists into power, has always been intrigued by the potential for high-tech manufacturing in China. But negotiations over three previously announced efforts to create joint ventures in China [ELECTRONIC BUSINESS, June 1, 1985 p42] never bore fruit. To Wang's dismay, all three projects reportedly stalled in a mire of bureaucracy and red tape.

Finally, though, the two sides worked out a deal. China, industry sources say, caved in on key demands after Wang threatened to abandon China and set up another manufacturing operation in Taiwan. So last October, Wang formally announced the formation of Wang Computer Industry Development Company Ltd., a Shanghai-based 60-40 joint venture between Wang Labs and Shanghai Computer Corp., with Wang holding the controlling interest. Total registered capital for the new company — which employs just under 50 people, including five department managers from Wang's Hong Kong operation — is $6 million.

To celebrate the opening of the plant, China last year even waived its bureaucratic airline regulations to allow Wang to fly into Shanghai from Tokyo on his private jet. The ceremony, too, took place on Oct. 11, the same day China announced its widespread economic reforms — a symbolism that was not lost either on Wang Labs or the Chinese.

Wang Labs says the new company will manufacture Chinese-language workstations built, for the time being at least, exclusively out of imported components. In the first full year of operation, the firm plans to turn out 1,000 units, all for internal Chinese consumption. Once local components pass Wang's rigid

AN WANG: After three abortive attempts, he was finally able to set up a joint venture in Shanghai

quality control standards, "we will consider exporting the product," says Raymond So, the general manager of the operation who divides his time between Shanghai and his home in Hong Kong.

General manager So also says Wang is working with the Chinese Ministry of Electronics Industry on a program to bring local component makers up to global standards. He says Wang's target is to start sourcing local connectors, integrated circuits, transistors, capacitors, printed circuit boards and other components by the fourth quarter of this year or by the first quarter of 1988.

Almost all of the Chinese employees at the Wang joint venture are college-trained engineers or technicians. They will form the nucleus of the management team that will run the new company's highly automated production lines. Once they know how to do the work themselves, So says, they will then be able to train the real production workers that Wang plans to hire at a later date. But it is important, the Wang general manager says, for the managers to be able to first master basic manufacturing skills. "If a supervisor just talks about how to do a job, but doesn't know how to do it himself, how will he be able to earn the respect of his staff?" asks So.

There have, of course, been some initial problems. So says Wang has already had to dismiss one employee who was unable to adjust to Western business practices. Local Shanghai government officials also say the joint venture had to wait about a year to get a license from the Pentagon to import a vital piece of U.S. test equipment for use in manufacturing.

Nevertheless, Wang appears to be pleased with the progress of the joint venture. Despite China's socialist system, Wang believes the Chinese are ready for American-style capitalism. "Underneath the surface, there is a lot of individualism in China," Wang says. "And compared with Japan and Korea, there is a lot more liberalism."

Ted Fitzgerald

any easier for U.S. corporations in the years ahead. In a nation of one billion people, most of them peasants, life moves slowly, they say, despite the best intentions of a whole new strata of younger technocrats that Premier Deng Xiaoping, the chief architect of reform, has put into place.

China's passage of its first patent law several years ago is a case in point. In 1978, the law was first proposed, according to Doris Wan Cheng, a consultant with Chicago-based U.S.-China Investment & Trade Corp. But it took two years of discussion before the country was able to pull together a national conference on the subject.

Citing the importance of West-East technology transfer, technocrats argued for rapid passage of patent legislation. No Western company would enter China, they pointed out, if their proprietary technology was appropriated. However, others argued against the proposal on the grounds that patents would only benefit Western companies. Meanwhile, a third faction argued that patents were a good thing, but the country should not be in such a rush to implement them.

Finally, after a long ideological debate, the technocrats won. A patent law was drafted and passed in 1983. But it is only just now being implemented, Cheng says. And even with the law on the books, there are still plenty of complaints about alleged patent infringement, and in many cases, it is still unclear which court, if any, will be the arbiter of these disputes. In recent years, Data General Corp., for example, reportedly has made some important inroads into China, but it would probably sell more minicomputers there if it did not have to compete with locally produced machines based on pirated DG technology.

Speed of reform

But the Chinese, in fact, are moving quickly to rectify past mistakes, according to C.B. Sung, chairman of Unison Inc., a San Francisco-based financial services and consulting firm whose client list in China includes Sun Microsystems Inc. and Varo Inc. Sung, who also owns a one-quarter interest in the Great Wall Hotel in Beijing, says that within one month of the October reforms, his joint venture hotel — which generates huge quantities of foreign exchange — was swapping currency with American Motors Corp.'s Beijing-based joint venture which generates *reminbi* (local currency) through the domestic sale of Jeeps. The swiftness with which these currency transactions were sanctioned by the government was unprecedented, says Sung.

Nevertheless, while most U.S. corporations, which earn *reminbi* by selling products to the local market, are more than happy to exchange Chinese currency for dollars, there is a downside to this arrangement. In Shanghai,

C.B. SUNG, part-owner of the Great Wall Hotel and a consultant to Sun and Varo, predicts the reforms will be implemented quickly

for example, the joint-venture to joint-venture exchange rate late last year was 4.7 *reminbi* to the dollar — versus 3.7 *reminbi* to the dollar, which was the official exchange rate.

While cash-heavy joint-venture hotels make out well in these deals because they are paying for their labor and supplies in local currency, foreign manufacturers still have to pay a penalty, sometimes as much as 25% to 35%. Gerald H. Gleason, vice president of Foxboro Co., which runs a profitable, 365-employee joint venture in Shanghai to manufacture industrial controls, says these government-sanctioned currency swaps may be a "good means of dealing with this problem for the time being in certain situations, but it's no way for joint ventures to survive."

A lot of what happens in China over the next few years, however, will depend on outside forces over which that country has no control. If petroleum prices rise, for example, China — a petroleum exporter — can more easily replenish its foreign reserves and purchase more electronics equipment. China, too, has had bountiful harvests in recent years, but a serious reversal in the agricultural sector could also throw a monkey wrench into modernization efforts.

Also, a lot depends on the degree to which the U.S. Department of Defense and Paris-based Coordinating Committee for Multilateral Export Controls (COCOM) relax their restrictions on high-tech exports to Communist nations. Currently, for example, there is a tremendous pent-up demand in China for U.S. semiconductor production equipment used in the manufacture of integrated circuits with linewidths of under three microns. If licensing procedures were liberalized, says He Mingzhang, a deputy manager in charge of component policy at the government-run China National Electronic Devices Corp., "we [in China] estimate we would buy over $200 million worth of IC equipment from the U.S."

But China cannot count on any of these things to happen. It can, however — through a variety of reforms — control events within its own borders. While reforms can prompt dislocations in the economy, including inflation and unemployment, China will continue to experiment with them, analysts say. Sullivan of the National Council for U.S.-China Trade says his greatest fear is *not* that the reform movement will reverse itself, but that it will be slowed by China's entrenched bureaucrats, many of whom may lose their political fiefdoms through reform.

In the meantime, most U.S. computer and electronics companies have adopted a "wait and see" approach. "Everyone here is aware of the enormous potential [for East-West trade]," says Raymond So, general manager of Wang Laboratories Inc.'s computer manufacturing joint venture in Shanghai. "But how soon the China market will really open up to the West is a matter of conjecture. It may take three years; it may take five; it may take 10. Nobody knows. But we are prepared to make a long-term commitment to China. And when China does open up, we'll be ready."

Some information in this report was obtained from speeches by individuals at recent seminars on China sponsored by the American Electronics Association; T.L.I International Corp. of Chicago; and the International Business Center of New England Inc. in Boston.

MRP II is alive, but will it ever thrive?

DEC, HP and IBM hope so. Their hardware sales stand to climb if MSA and others deliver the right manufacturing software

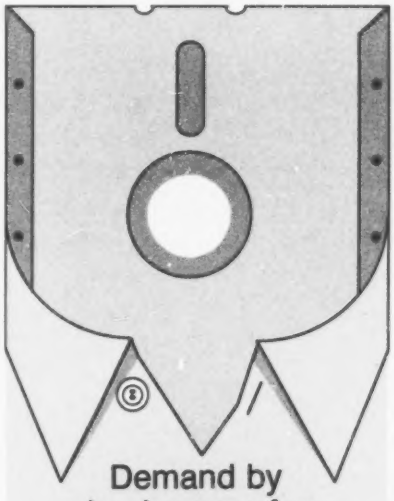
By Mary Jo Foley

Throughout the 1980s, automation has been touted as one of the best ways to restore competitiveness to U.S. manufacturers. Yet, demand by American businesses for manufacturing resource planning (MRP II) software, seen by many as the keystone to true computer-integrated manufacturing, has remained flat throughout most of the decade. The U.S. MRP II market was barely $400 million last year.

Some analysts say this discrepancy exists because complete MRP II systems — comprised of any number of modules including materials and planning control [also called MRP I], lot tracking, shop-floor control, just-in-time (JIT) production, purchasing, manufacturing accounting and so forth — are too expensive for companies outside the *Fortune* 500 realm to buy and maintain. For example, an average system, minus the hardware, can run as high as $200,000.

Others say existing MRP II software is too data-processing oriented to be helpful to the people it is designed to serve: managers and supervisors who require real-time manufacturing data at the shop-floor level. And other market researchers and MRP vendors claim rapid advances in MRP II technology have resulted in the market surpassing the needs of potential customers, many of whom still rely almost entirely on manual manufacturing-related processes.

As a result of these and other causes, MRP II is a market considered to be near death by numerous industry analysts. "MRP II will experience the same, slow death as U.S. manufacturing, unless the software community changes the basic nature of what they're selling," says one such analyst, Glen Almendinger, president of Boston's Harbor Research Corp.



Demand by businesses for MRP II software has remained flat for most of the decade

Within the past year, these ill-wishers nearly saw their predictions come true, as evidenced by the confused spate of year-end acquisitions, mergers, new product cancellations or delays, or both. In the biggest move of the year, Atlanta's Management Science America Inc. (MSA) bought out two MRP firms: RTS Ltd. of Dublin, Ireland, a maker of IBM-based mini packages; and Comserv Corp. of Eagan, Minn., one of the granddaddies of mainframe MRP II.

Remaining MRP vendors, meanwhile, axed long-anticipated debuts of software for mainframe computers and microcomputers. ASK Computer Systems Inc., for example, decided to halt work on adapting, or porting, its Manman package, originally developed for the HP 3000 machines, to the oversaturated and somewhat sluggish IBM 43XX system marketplace. Other vendors shelved new product plans, often citing user MRP overload as their reason. Micro MRP Inc., for instance, is holding off on promoting its just-in-time module.

Even the host of new minicomputer and mainframe models introduced by nearly all of the top computer vendors during 1985 and 1986 were not enough to boost sagging MRP morales and shipment levels. Hewlett-Packard Co. (HP), one of the few computer hardware manufacturers to develop and sell its own MRP II package, for one, openly questions the appeal of powerful uniprocessors to manufacturing companies interested primarily in distributed processing involving multiple midscale systems.

"It's still not clear how significant the impact will be," HP's Michael Galane says of his company's new high-end Spectrum minicomputers, "since few customers are running MRP on our existing top-of-the-line [computers]." Galane is research and development manager for HP's newly created Manufacturing Productivity Division in San Jose, Calif.

Relief may be in sight

But relief — although only temporary — may be in sight. Despite the fact that nearly all of the MRP leaders say they expect this year to be another flat one, several industry watchers have stuck out their necks by calling for substantial MRP II sales growth in 1987. "The market definitely will grow in terms of companies interested in doing MRP," says Christopher Grey, president of Oliver Wight Software Research, a market research firm

in Newfields, N.H.

International Data Corp. (IDC) is far less conservative in its outlook. The Framingham, Massachusetts-based market research firm predicts mainframe and minicomputer MRP II software sales will jump a whopping 40.3% to $598.7 million this year.

"The doldrums of the last couple of years occurred in part because users were making long-term plans to buy systems," explains Adam Zais, IDC's director of computer-integrated manufacturing (CIM) services. This is the year users finally will take the plunge. Next year, however, Zais says, a more characteristic 20% MRP II growth rate will resume.

Much to the delight of most of the MRP industry, demand for the long-standing top two MRP products — Copics (IBM's mainframe MRP II software) and Mapics (its mini-MRP II package) — at last appears to be waning. The importance of the IBM name on products — that are little more than "financial/inventory systems," in the words of Zais — is shrinking in the face of meaningful enhancements being introduced by IBM's competition. These include benefits such as artificial intelligence-based user interfaces, compatibility with the Unix operating system and built-in links to standard computer-aided design and engineering (CAD/CAE) packages.

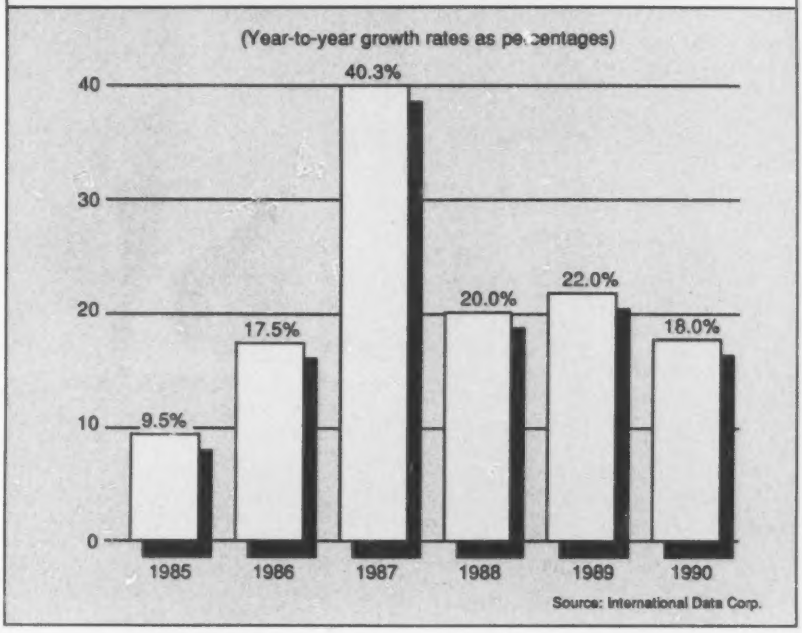
"If IBM wants to continue to dominate the [MRP II] market, it just needs to introduce an updated line," cautions Grey. But according to most sources, the Armonk, N.Y., giant does not have new MRP products waiting in the wings — at least for now.

Most other major computer manufacturers, with the notable exception of HP (which claims MRP II is its best-selling software product), are loathe to enter the hotly contested MRP world. Granted, NCR Corp., Unisys Corp. and Xerox Corp. continue to sell their own MRP II packages. But the vast majority are following in Digital Equipment Corp.'s successful footsteps by forging relationships with established third parties for their MRP II packages. In a major coup, DEC this past year signed three of the industry leaders — ASK, Cincom Systems Inc. and System Software Associates — as full-fledged DEC Systems Cooperative Partners. Under the arrangement, a partner either resells DEC hardware or refers customers to DEC for their hardware purchases; DEC, in turn, steers its hardware customers toward its software partners when such customers seek MRP II solutions.

In addition, a growing number of MRP software vendors claim to be looking into selling integrated MRP II turnkey systems (if they are not doing so already), thereby becoming major value-added resellers for computer manufacturers. MSA, for example, is evaluating the possibility of reselling IBM's new 9370 superminis with its MRP software, according to MSA executive vice president Dennis Vohs.

This reliance by computer manufacturers on independent software vendors does not mean the hardware vendors do not have a direct stake in MRP. Additionally, because most MRP II systems are sold in conjunction with new computer systems, it matters quite a bit which vendors' software has been ported to which

The lengthy MRP/CIM business cycle peaks: MRP II software sales in the U.S. skyrocket in 1987



The ABCs of MRP

The term MRP II was coined by manufacturing guru Oliver Wight during the late 1960s, at the time when IBM and Pick Systems were pioneering the concept of factory-automation software. MRP II software — so designated to distinguish it from MRP I [materials requirements planning] packages, which are a subset of MRP II — may consist of any number of modules linked together. Typical modules include inventory control, bill of materials, master scheduling, MRP I, routing, purchasing, general ledger, capacity planning, shop-floor control and order entry, among others.

The easiest way to picture MRP II, suggests International Data Corp. analyst Adam Zais, is as the third "leg" of the computer-integrated manufacturing (CIM) "stool," with the other legs being computer-aided design/engineering (CAD/CAE) and computer-aided manufacturing (CAM). In the ideal factory of the future, the three systems should be able to exchange data via a common database. This way, for example, an engineer would be able to check whether parts were available using a system's MRP inventory control module before designing them into a project using a CAD system. □

vendors' machines.

In mainframes, where IBM totally dominates the marketplace, the porting issue is less crucial. But in minicomputers, it is vital. At the end of last year, 39.7% of all mini MRP II software was running on IBM System/3X equipment, according to IDC estimates. Another 24.6% was running on HP 3000 machines; 11.9% on DEC VAX systems; and the rest on various other minis.

Those minicomputer percentages will change drastically within the coming years, predicts IDC's Zais, with DEC "quickly eclipsing HP" as the No. 2 MRP hardware vendor — mostly as a result of its strong third-party connections. At ASK, which sells both DEC- and HP-compatible versions of its MRP software, demand for the two versions has recently shifted from a 35% to 50% demand for DEC at HP's expense, says ASK director of marketing David Sohm. MSA's Vohs goes so far as to say "one of MSA's highest priorities will be to address the DEC marketplace." Currently, all of MSA's MRP II software is IBM-based.

IBM, meanwhile, "will maintain its installed base, but will have trouble maintaining a large share of the new (mini MRP II) shipments," Zais claims. In what amounts to more good news for DEC, mini-based MRP II will overshadow mainframe-based MRP II in terms of units and dollars in the not-too-distant future. "Already we're starting to see smaller systems," as opposed to single, centralized systems, "bought by customers as solutions to departmental and plant problems," Zais says.

MSA's VOHS: "One of MSA's highest priorities will be to address the DEC marketplace"

On the micro front

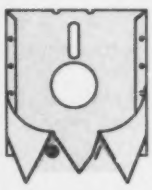
This emphasis on distributed, departmental MRP solutions also makes for strong growth on the micro-MRP II front. Because there are between 75 and 100 companies that sell products ranging in price from $1,000 to $100,000 which consider themselves to be vendors of micro MRP software, it is difficult, if not impossible, to get a consensus regarding the size of the market. But, as noted by Richard Thau, president of the acknowledged market leader, Micro MRP, there are 400,000 manufacturing companies (potential customers) worldwide with revenue under $25 million. If 10% of them invest in micro MRP systems within the next five years, Thau says, the worldwide micro-MRP II market could reach anywhere between $3 billion and $5 billion.

Analysts agree micro MRP II is a market poised for growth. As evidence, several point to Micro MRP's customer list, which reads like a Who's Who in the electronics business: Harris Corp., IBM, Intel Corp., Eastman Kodak Co., Martin Marietta Corp., Westinghouse Electric Corp. and others. But to date, total micro-MRP II sales have approached nowhere near the 40,000 unit, $3 billion level. Thau's Foster City, Calif., company claims 1,400 installations to date. Few, if any of its competitors claim more than 300 installations.

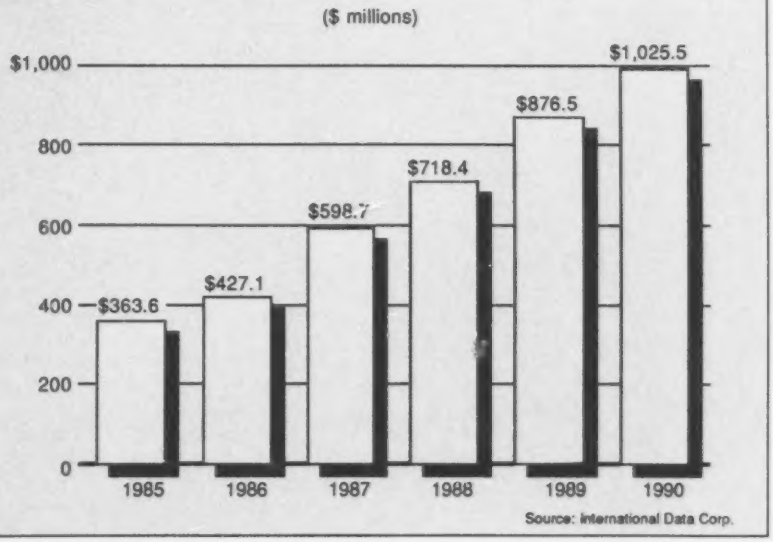
In Micro MRP's case, neither high price nor lack of features is a sales deterrent. A typical multiuser IBM PC-based configuration of MAX (Micro MRP's production manager software package) runs about $10,000, and includes bill of materials, inventory control, communications interface, master scheduling, MRP I, purchasing control, shop-floor control, costing, management performance, interplant communications, accounting and data collection modules. Instead, Micro MRP may be too far ahead of its customers, Thau admits. The company recently completed successful testing of its new JIT module, but has been forced to shelve it temporarily due to lack of demand.

"A lot of repetitive manufacturing, upon which JIT is based, is still happening overseas more than here," Thau explains. "If you look at small- to mid-sized [U.S.-based] manufacturing companies, fewer than 3% are using computerized [manufacturing] systems. We've got to get our customers to walk before they trot."

Guarding against too-rapid technological advancement is not an issue



MRP II—hardly a dying market
Worldwide sales by U.S. vendors of mainframe- and mini-based MRP software



limited to the micro-MRP arena. "The focus [of MRP II] today is on compatibility with office products, rather than adding new functionality and modules," says HP's Galane. Accordingly, simplifying and customizing HP's system, known as HP Manufacturing Management II, is the order of the day. "Customers want more flexibility," Galane explains. "They want ports germane to their businesses that don't affect [MRP II] source code. And they want better overall integration, providing timeliness of information to various departments."

HP has undertaken various technological and organizational changes to achieve these ends. The Palo Alto, Calif., company added screens to its system, allowing users to customize their MRP II systems without having to do any programming. HP also is expected to PC-level communications software that will enable users to integrate information generated and stored by existing PC software products with information within HP's MRP system.

On the organizational front, HP recently moved responsibility for its Manufacturing Productivity Division from its more technically oriented Manufacturing Systems Group to its commercially-oriented Business Systems Group. And, recognizing its product "isn't an entry-level, first-time user system," the company is ramping up its value-added channels program by providing customer referrals for more basic MRP II offerings, as well as MRP II software targeted at specific vertical niches, Galane says.

Large-scale MRP plans

MSA, like HP, is in the midst of structural changes designed to streamline its MRP business. At the beginning of the year, it established the MSA Advanced Manufacturing subsidiary, headed by executive vice president Vohs. It is responsible for MSA's, RTS's and Comserv's manufacturing products. The three lines last year generated $100 million in MRP sales, Vohs says. Some analysts claim that MSA, as a result of its acquisitions, already is the new No. 1 MRP II vendor.

> "The focus [of MRP II] today is on compatibility with office products, rather than on adding new functionality and modules"
>
> Michael Galene of Hewlett-Packard

Most of MSA's efforts in the coming year will center around making its three product lines compatible. The company also will work to enable its Information Expert product, which is a natural language/expert system designed to facilitate user access to MSA's various application software, to interface with Comserv's MRP products. Finally, Vohs says, MSA will work with vendors of industry-standard CAD/CAM, bar coding and other manufacturing-related software, to develop built-in links between their packages and MSA MRP products. Comserv's AMAPS package already contains a module which enables it to interface directly with IBM's CADAM package.

ASK Computer earlier this year introduced its own version of a CAD/MRP link, called Manman Engineering. Additionally, several ASK customers have built their own links between Manman and various automated storage and retrieval systems. In the coming year, the Los Altos, Calif., company plans to focus on marketing turnkey systems costing under $80,000 based on DEC's MicroVAX and HP's Micro 3000, according to ASK director of marketing Sohm. And, like other MRP II vendors, ASK "will try to understand the requirements of specific vertical markets," Sohm says. "We'll focus on vertical niches [such as automotive, electronics and defense], which have the opportunity to expand to other markets in the future." □

IBM hangs onto its installed-base lead in mainframe-based MRP II software...

Company	Number of system sites	Percentage of total MRP sites[1]
IBM (Copics)	500	3.4%
Comserv [2]	480	3.0%
Sperry [3]	400	3.0%
Cullinet	250	1.5%
Management Science America	211	1.5%
Martin Marietta	200	2.8%
Burroughs [3]	185	1.0%
Honeywell	175	1.0%
Cincom	150	1.0%
Xerox	150	1.0%

...as well as in mini-based MRP II

Company	Number of system sites	Percentage of total MRP sites[1]
IBM (Mapics)	3,500	24.0%
Hewlett-Packard	1,500	10.0%
NCR	1,188	7.0%
ASK	1,000	7.0%
Pilot	1,000	6.0%
System Software Associates	688	4.0%
NCA	600	4.0%
Data 3	325	2.0%
Management Science America	300	2.0%
Martin Marietta	200	2.0%

[1] Total number of mainframe, minicomputer and microcomputer-based MRP system sites = 14,700
[2] Management Science America bought Comserv in 1986
[3] Sperry and Burroughs merged in 1986 to form Unisys

Source: International Data Corp.